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ABSTRACT

The design of a proposed occupational clustering system for the Comprehensive Career Education Model (CCEM) was to meet three general criteria: (1) encompass most existing jobs, (2) translate into an entire K-12 curriculum, and (3) show clear advantages over other systems. However, upon examination of existing clustering systems for relevance and possible adaptation, no one system met all the criteria. Therefore, a new clustering system was devised by synthesizing useful features of existing systems. The proposed system has two crucial dimensions--one stressing functions and contents of occupations, the other emphasizing status or levels of occupations. The proposed clustering system was planned to fulfill three instructional functions: (1) inform students about the world of work, (2) assist students in choosing a suitable career, and (3) provide models to shape instructional objectives and learning experiences. (Author/JS)

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John E. Taylor, Ernest K. Montague,
and Eugene R. Michaels

HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street • Alexandria, Virginia 22314

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The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University, Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation.

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FOREWORD

This publication marks the completion of the Human Resources Research Organization Project S72-17 (P 72-20), The Validation of a Set of Occupational Clusters for use in the Comprehensive Career Education Model (CCEM). The project was performed for the Center for Vocational and Technical Education of The Ohio State University. Dr. Aaron J. Miller, Coordinator of Field Services and Special Projects for the Center, was the Technical Monitor for the project.

The research was conducted at HumRRO Division No. 3, Presidio of Monterey, Calif. Dr. Howard H. McFann is the Director of the Division. Dr. John E. Taylor was the Principal Investigator, with Dr. Ernest K. Montague and Mr. Eugene R. Michaels as members of the research team.

This work was supported in part by Grant No. OEG-3-7-00158-2037 by the Office of Education, U.S. Department of Health, Education and Welfare, to the Center for Vocational and Technical Education, The Ohio State University. Investigators undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education or Center position or policy.

Meredith P. Crawford
President
Human Resources Research Organization

SUMMARY

PURPOSE

The purpose of this study was to locate or design an occupational clustering system for the Comprehensive Career Educational Model (CCEM) being prepared by the Center for Vocational and Technical Education, The Ohio State University.

The clustering system was expected to meet three general criteria: It was to encompass most existing jobs; it was to be translatable into the design of an entire K-12 curriculum; it was to show clear and specific advantages over other clustering systems.

APPROACH

A review of the research and other literature was undertaken to examine the clustering systems already in existence that might be adopted or adapted to the purposes and requirements of the CCEM. The clustering systems described in the literature were of three main types: descriptive, sociological-psychological, and task-analytic.

None of the clustering systems identified met all three requirements: If they were inclusive, the basis on which occupations were dimensionalized was not useful for curriculum design in terms of the CCEM; if they were designed for vocational education, their conception was too narrow to apply to a general K-12 curriculum. In short, no existing clustering system could be directly applied to the CCEM. Therefore, a new clustering system was devised by synthesizing useful features of existing systems.

THE PROPOSED CLUSTERING SYSTEM

The proposed system employs two dimensions as crucial for informing, guiding, and preparing students for the world of work. One dimension represents the functions and contents of occupations, including broad complexes of occupations and institutional arrangements of the world of work. The other dimension represents the status or levels at which occupations exist. This second dimension is a shorthand means to incorporate a complex of important variables attendant on occupational choice, such as educational and training requirements, daily schedule and routine, degree of freedom and responsibility, mobility, and so on.

These two dimensions have been arranged into two main matrices, providing a means for coordinating the particular instructional goals of the CCEM. The first matrix consists of 12 institutional areas and seven career levels into which all existing jobs can be placed. This matrix, in various collapsed forms, is usable throughout grades K-10. The second matrix, for grades 9-12, retains the dimension of seven career levels, but is changed from the institutional area to an occupational function dimension for selection of an occupation to enter; nine occupational categories are combined with the seven career levels.

USE AND IMPLICATIONS OF THE CLUSTERING SYSTEM IN THE K-12 CURRICULUM

The clustering system is designed to serve as a planning vehicle to fulfill three instructional functions: providing students with information about the world of work,

helping them choose a career congruent with personal interests and talents, and providing models that shape instructional objectives and learning experiences.

A general curriculum structure, built from nine processes, is proposed as the means for adapting the present school curriculum into one that is consonant with the goal of career education and the objectives of the CCEM.

Through the nine processes, inputs arising from various entry requirements (basic cognitive skills, job entry, college entry) can be placed into a comprehensive structure to determine the content of the K-12 curriculum. The clustering system can be used, within this structure, to determine career information, guidance, and selection learning experiences.

The use of this clustering system makes feasible a highly individualized curriculum, meeting any combination of student goals.

CONTENTS

An Occupational Clustering System and Curriculum Implications for the Comprehensive Career Education Model

REVIEW AND ANALYSIS OF CLUSTERING SYSTEMS

INTRODUCTION AND STATEMENT OF PROBLEM

Career Education

Comprehensive career education is a major experimental attempt to redirect and reintegrate the purpose, structure, and function of the public educational system toward more valid and meaningful preparation for the world of work. Toward this end, the U.S. Office of Education (USOE) has funded several large educational research centers for the launching of various home-based, work-based, and school-based models of career education and preparation. This project report is intended to contribute to the school-based model of career preparation as developed by the Center for Vocational and Technical Education of The Ohio State University, by proposing a clustering system that will help integrate the world of work with a career education system.

The School-Based Model for Career Education

The Comprehensive Career Education Model (CCEM) is an attempt to revise the public school program to provide better answers to the vocational needs and aims of all students, rather than to only a part of the student body. An effective model must include (a) provisions for the gaining of adequate knowledge about career aims and choices at all levels of age and occupation; (b) preparation in a wide range of basic knowledge and skills; (c) utilization of the *entire* curriculum as a medium for integrating knowledges and attitudes about occupational choice including important social, economic, and personal factors that influence and are influenced by occupational choice; and (d) a means for preparing for appropriate occupational entry.

The CCEM envisions a sequential program of preparation from kindergarten to high school graduation, stressing personal and occupational *awareness*, *orientation* toward occupational realities and roles, *exploration* of specific job families, *selection* of clusters for beginning preparation in a specific area, and *preparation for entry* into a job area or into further specialized training and education. Such a sequence would be roughly divided into grades 1 to 6 for development of awareness of the world of work and its personal and social significance; grades 7 and 8 for providing experiences related to forming occupational attitudes and potential roles, and consolidating subject matter toward exploration of occupational families; grades 9 and 10 for tentative narrowing and deeper exploration in occupational areas; and grades 11 and 12 for further specialization and in-depth preparation. The educational program would integrate occupational awareness and choice into the entire curriculum.

As a result of this program, students are expected to develop in four ways:

(1) Self-awareness and understanding of their interests and abilities in relation to possible careers.

(2) Attitudes and understanding regarding the significance of work in social, personal, and economic terms.

(3) Understanding of the pervasive and intimate relationship holding between work roles and other life roles and styles.

(4) Skills and capabilities permitting, at the least, occupational entry.

Occupational Clusters

The present project aimed at providing a set or sets of occupational clusters that can be used from grade K through 12 for career development.

The term "cluster" has taken on a variety of meanings. It may refer to a simple grouping of seemingly like jobs, to broad institutional groupings such as transportation or manufacturing, to groupings based on similar job products, to groupings based on analysis of work tasks, and so on. The type of cluster developed depends upon the particular purposes and requirements of the agency doing the clustering. Overall, the field of occupational clustering is marked by a diversity of criteria and variables, and a paucity of comprehensive frameworks.

The criteria originally developed for this project require that the system be:

(1) Inclusive. The clustering system must encompass most existing jobs.

(2) Operational. The clusters must be capable of being used for training. They must be congruent with labor-market entry jobs, and must be translatable into curricular materials and instructional strategies, so that a person trained in the basic skills of a cluster would have entry-level job potential in a variety of jobs within the cluster.

(3) Viable. The recommended system must have clear advantage over other systems for use in the CCEM.

From these general criteria, we have developed certain premises that guide the selection or synthesis of a clustering system and that have implications for a CCEM. A clustering system should:

(1) Permit career preparation to be flexible, generalizable, and relatively comprehensive, allowing students to acquire broad skills and capabilities for entry into a range of related jobs. It must not handicap the student in exercising the option of further education by narrowing his training around too specific skills.

(2) Serve as a means of introducing students to the great variety of jobs within a format that is easily comprehensible.

(3) Provide means for organized exploration of career possibilities that exist within an occupational area.

(4) Contain dimensions that provide students with a clear conception of important attendant variables related to career choice and development. Such variables include:

- (a) Educational and training requirements for entry.
- (b) Expected income and economic projections about occupations.
- (c) Working conditions to be expected, such as daily routines, schedules.
- (d) The degree of power, personal freedom, and responsibility inherent in broad strata of occupations.
- (e) The presence or absence of lateral and vertical avenues of mobility in various strata of work.
- (f) The present and projected influence of institutional organization and stratification in industries and unions.
- (g) The life styles attending various strata of occupations.

(5) A clustering system should be usable in the design of curricula meeting the general goals of awareness, orientation, exploration, selection, and preparation.

(6) A clustering system and its accompanying curricular guidelines must take into account the markedly different natures of the age populations being served. Maturity level and fantasy/reality orientations change sharply over the 12 school years.

(7) A clustering system must be related to and be able to draw upon the more organized and detailed work that has been done in the field; it cannot stand alone. Many present systems are isolated and unique and cannot draw support from present bodies of information.

All this constitutes a large order. No past system, to our knowledge, attempts to cover a comprehensive curricular model. Yet, the envisioned curriculum requires such a model. To the degree that the present project attends to all premises it will be useful.

A REVIEW OF PAST SYSTEMS

Through the Educational Resources Information Center (ERIC) system, library research, correspondence, and the authors' past experience, a variety of typical clustering systems were studied or briefly scanned. Because of the relatively short time for study and the unpublished status of many attempts, complete coverage is not claimed. Nevertheless, all major and relevant efforts are at least typified in the search. Over 60 references were obtained, many of which could be quickly dropped as marginally related to our needs. Correspondence, initiated with several persons, had generally minimal results. This section will cover, first generally, then in greater detail, the results of the search.

General Review

Although the term "cluster" has many meanings, it is felt that the great majority of past work may be fitted into three groups without undue damage to any. These three groups may be characterized as *descriptive*, *sociological-psychological*, and *task-analytic*. These are not clear or unmixed groupings. Like the clusters or families they cover, they possess many inconsistencies, mixed categories, and blank spaces.

Descriptive Approaches. Educational workers generally have been interested in categories that relate heavily to teacher and student training, that reflect job categories as they presently exist, and that are readily adapted to current vocational and technical curricula, staff, equipment, and guidance facilities. Although these systems may include consideration of student skill, knowledge, attitudes, and other personal characteristics, they are primarily based upon an informational approach to occupational areas or families rather than on analysis and synthesis of broad job needs and their relationship to student characteristics.

Such systems are intended for employment market information and vocational guidance and are exemplified by a joint publication of the U.S. Departments of Labor, and Health, Education, and Welfare, entitled *Vocational Education and Occupations* (1), or by various Department of Labor publications, such as the *Occupational Outlook Handbook* (2) and like publications. To a certain degree, the very complete draft (3) of 15 occupational clusters developed by the Division of Vocational and Technical Education of the USOE falls into this descriptive approach, although its implications are considerably broader.

Sociological-Psychological Approaches. A second broad class of systems comes from psychologists and sociologists interested in various aspects of worker characteristics as these relate to life styles and occupational choices. A great range of personal attributes, such as job satisfaction, mobility, personality traits, work attitudes, personal value systems, vocational interests, and the interaction of total life style and work, have been studied. Much has been written on such variables as status, leadership, and work performance.

In an attempt to systematize these wide-ranging variables, some writers—Roe (4), Super (5), and others—have developed one-, two-, or three-dimensional matrices of occupational families arranged in order of vertical (status) and horizontal (occupational areas) position. The *Dictionary of Occupational Titles* (DOT) (6) represents a mammoth categorization that handles the several variables of status, occupational family, worker

characteristics, and working function (i.e., emphasis on people, data, or things). Robinson, Athanasiou, and Head (7) have performed a detailed and valuable task in attempting to describe and draw together some of the many approaches. They themselves outline a simplified method of coding occupations in a listing that combines status and occupational area characteristics.

Task-Analytic Approaches. The development in recent years of two approaches to occupational training results in another means of classifying job or occupational characteristics.

The first is typified by Smith's several publications (8, 9, 10), in which he described methods for analyzing job and task needs and requirements and for carrying these job-functional characteristics back to the training site for the purpose of defining training objectives, means, and equipment in preparing workers or students for specific jobs or job families. This approach led to emphasis on highly functional preparation, fixed mastery levels, variable training-time schedules, and other properties of a job-function approach to training.

The second approach is that of Maley (11) and others (12, 13, 14, 15, 16) in utilizing the Smith or similar rationale to study the common task requirements and characteristics of a wide range of skill families. The combined outcome has been as follows:

(1) A renewed consideration of actual task requirements based upon behaviors or actions of persons doing the task.
(2) Training schemes based upon total job-functional characteristics.
(3) Recognition and development of functional similarities relating jobs and job families.
(4) Recognition and development of underlying functional skills and knowledges that are common to several jobs or job groupings.

Specific Review of Comprehensive Occupational Frameworks

Every clustering scheme is, in the end, a judgmental arrangement, selecting from a wide variety of dimensions those that are most important to the purpose at hand. Our purpose was to meet the needs of total curricular change, and our needs went beyond the dimensions of any system reviewed. To make this point more clear, it is desirable to look more closely at a few typical major efforts, keeping in mind the necessities of our effort.

Prior to these descriptions, three basic assumptions or predictions developed from our general experience and from early review should be noted:

First, it was assumed that no one system would answer all needs, that development of a quite new system would require prolonged, extensive effort, and that current systems would provide only partial answers—fitting in some places and not in others.

Second, it was tentatively felt that any system to be used could neither be devised entirely new nor be based on lone efforts that were limited in scope and not widely disseminated. That is, there was an underlying feeling that a system intended for a broad curricular purpose and for wide use should somehow be related to the broadest, most useful of materials readily available to workers in the field. (It is no accident that every systematic effort at job clustering has been preceded by long and arduous gathering of many partial, somewhat isolated and unrelated efforts of others, efforts not readily available.) While this uncertain premise did not narrow our task, it probably influenced later decisions.

Third, there was much concern from the beginning regarding the number of necessary dimensions that could be handled in a single system without rendering it so complex as to be unworkable. Early in the task, it was felt that a system must be comprehensive but understandable, inclusive but readily adapted to use.

The remainder of this section provides a somewhat more detailed review of the more systematic occupational categorizations considered. It does not include local systems for which little rationale could be obtained (17). It does not include military systems with which we were familiar; while the military occupational specialties are well systematized, they are narrower in range than present purposes require, tend to be written in general terms, and are not easily available.

(1) Department of Labor Publications. By all odds, the most complete system to come to our attention was the many related component parts of the Department of Labor publications. These are the volumes of the third edition of the DOT with supplements, *Vocational Education and Occupations, Occupational Manpower and Training Needs* (18), *Occupational Employment Statistics, 1960-1969* (19), and related publications. The DOT volumes present a wide coverage of occupations, and a systematic way of considering the important variables of functional job relationships, worker characteristics, job conditions, training time, and the very important factor of a functional *level* in dealing with people, data, and things.

The basic occupational categories are essentially a mixed classification based primarily on status or level (professional, technical, managerial), with some based upon institutional structure (e.g., farming, fishing, and service occupations). Nevertheless, as the breakdown to divisions, groups, and subgroups continues, there are provided both a measure of functional similarities among similar skills, and two ways of characterizing occupations (in terms of worker characteristics and job characteristics, Supplements 1 and 2).

On the positive side, the DOT and other Department of Labor publications provide the only widely disseminated body of materials on which an immeasurable amount of work has already been accomplished and within which are based well-rationalized clustering or grouping systems.

On the negative side, there are a number of factors. It is, at first glance, a complex system and requires familiarity and training to use it.

Second, as Volume I states (pages iii and ix), the descriptions and information given therein are of a typical and general nature, not specifically applicable to an individual situation, and are based on 75,000 observations of 45,000 jobs, some of these based on data other than actual interviews with workers. Experience indicates that information from job holders may vary from that given by supervisors, employers, and industrial organizations. Consequently, conclusions regarding the grouping of seemingly similar tasks are somewhat weakened.

Third, for some purposes, as Maley points out, some DOT groupings are too narrowly defined for easy inclusion in a task-analysis cluster system or, on the other hand, are duplicated in separate divisions because of mixed categorization. Maley, and Altman and Gagne, as quoted by Maley[1], felt that DOT groupings were not appropriate for developing occupational families, and that new job and task analyses based upon new sampling would be required. It may be said at this point that no matter how true this may be, the monumental task of accomplishing this new analysis has hardly been touched, nor is there evidence showing that it is likely to be.

(2) Bureau of Census. The Bureau of Census has long used a coding system for occupations and industries (20). This has been reviewed, along with associated studies of socioeconomic variables. Two major headings, Industrial Classification and Occupational Classification, are subdivided into appropriate categories. While these listings are fairly comprehensive, they are intended for the information storage and retrieval purposes of the Bureau of the Census and do not appear easily translatable into curricular terms.

[1] Reference 11, Part IID.

(3) U.S. Office of Education. The Division of Vocational and Technical Education of the U.S. Office of Education has responded to the need for clustering systems adaptable to educational use by issuing a draft of 15 comprehensive, but skeletal, occupational frameworks, unaccompanied by an organizational rationale. The 15 main headings are primarily functional in their implications (transportation, environment, communications, etc.), but include some traditional institutional groupings (public service, marine science, agri-business, and natural resources). The internal construction of many clusters is mixed. Some, such as *Business and Office Occupations*, are fairly consistent in dealing with subclusters of jobs with similar task descriptions (e.g., secretarial, clerical, records maintenance). Others, such as *Manufacturing or Transportation*, tend to mix or blur lines of family distinction so far as job or task training is concerned.

A particular virtue of this system is its broad coverage and its emphasis upon changing and emerging fields. It is seen as a feasible general guide for the earlier information - orientation - exploration phase of student preparation, but seems difficult to relate to other materials and efforts necessary in the development of the later preparation of students for occupational entry. Much needs to be done to put flesh on the skeletal framework.

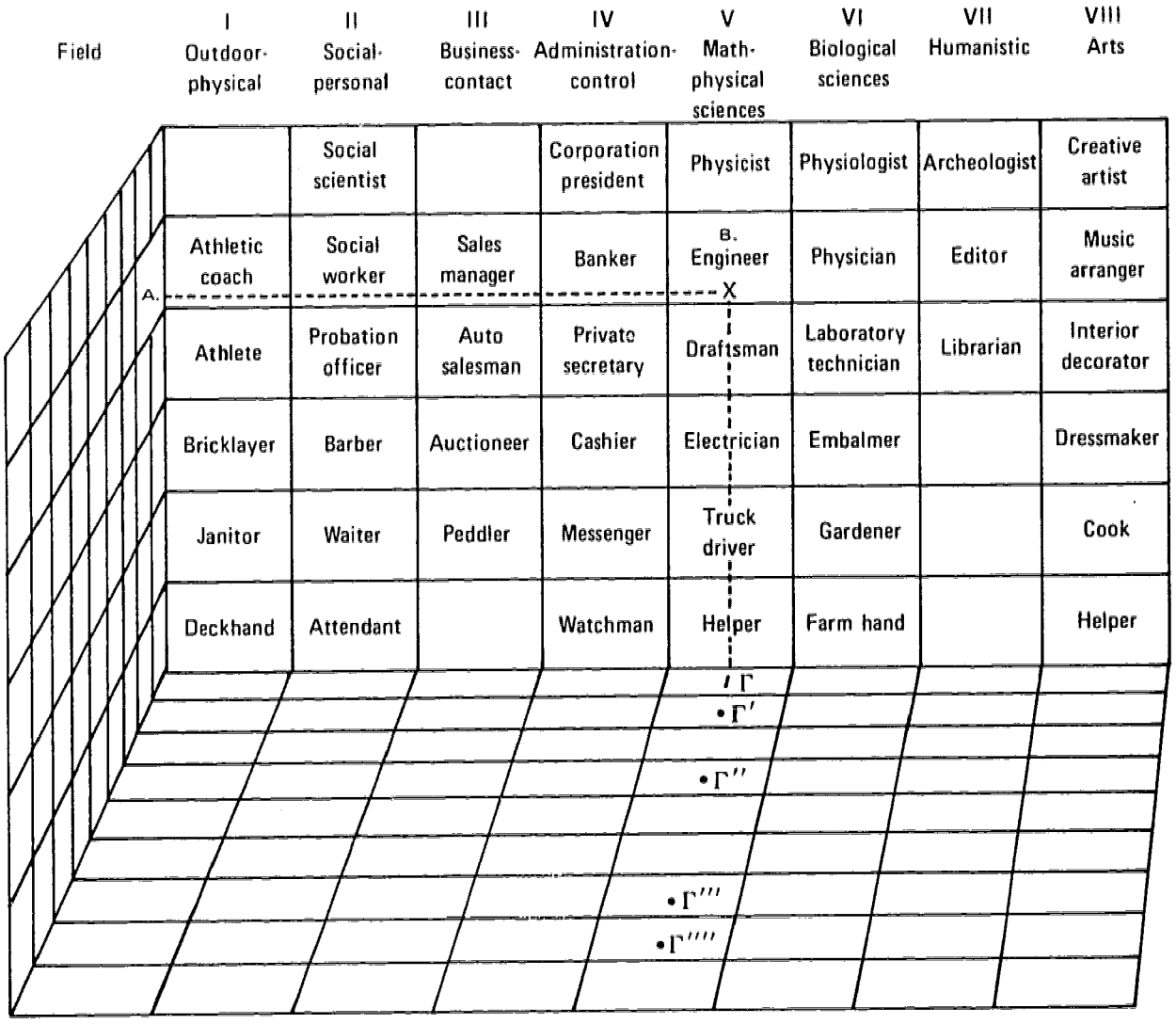
(4) Sociological-Psychological Systems. Roe and Super (4, 5) and others have been concerned with the vertical dimension of occupations. Indeed, it may be said that much of occupational sociology and psychology is the study of mobility. These studies bring into play personal and occupational characteristics that cannot be ignored in student orientation to the world of work. Some of these are (a) work as the determiner of status (and, conversely, status as a determiner of occupation); (b) work as the source of other than livelihood—power, autonomy, way of life, security, group belonging, self-determination, and others; (c) for a growing number of people, work as a necessary, but not integral, part of a life scheme.

For these writers, emphasis is placed on socioeconomic or other indices of status and on a horizontal dimension variously called "situs" or, in Super's term, "enterprise." Super's and Roe's schemes are presented in Figures 1 and 2. Three dimensions are implicitly or explicitly defined. In Super's model, a distinction is made among (a) *level*, which defines prestige, income, authority, freedom of action; (b) *field*, which we tend to define as a functional definition of the general type of work accomplished; and (c) *enterprise*, which corresponds to our definition of institutionally defined industrial or business areas. These same distinctions are made in Roe, although she emphasizes field rather than enterprise as a horizontal dimension. Morris and Murphy (21), in a study of situs, or horizontal status equivalence of work areas, differentiate occupations into ten functional areas (e.g., Commerce, Education and Research, Manufacturing) and four prestige strata.

Although these models were intended by the authors as exemplary rather than exhaustive coverage of occupational areas, they are of particular value in showing the necessity for considering several broad dimensions in one way or another, and for calling attention to other than purely job-training dimensions.

(5) Task Analysis Systems. The systems to be treated in this section are based on an approach to the development of training courses that has been well described by Smith, and Ammerman and Melching (22). They are characterized by detailed study of the skills and knowledges found in the various tasks making up a job, determining the common skills and knowledges that cross the boundary lines of a given cluster of tasks (or jobs), and constructing objectives and courses that provide skills for a range of related tasks or jobs. It is important to note that the relating thread is not the geographical area of the jobs, not the commonality of job product, not traditional academic partition, but, rather, the common skills and knowledges defined by what is done to what recipient (person, datum, thing), to what criterion of completion, and with what equipment. Finally, it

Super's Occupational Classification System



NOTE: Dotted lines and other symbols are references for locating a "civil engineer employed in conservation work for the National Park Service" or in "a mining company" or in "the telephone company."

Source: Super, Donald. *The Psychology of Occupations,* Harper and Row, New York © 1957, p. 48. Reprinted by permission of the copyright holder.

Figure 1

must be noted that these systems are job-training related, and are intended *only* for job preparation, once job choices have been determined.

Briefly, Smith's description covers several steps:

(a) Analysis of the job setting.
(b) Detailed analysis of job and task.
(c) On the basis of the task breakdown, construction of proficiency or criterion measures.
(d) Specification of crucial skills and knowledges.
(e) Determination of training objectives.
(f) Construction of the course in a job-like functional context around the objectives.
(g) Evaluation of course outcome, using job-derived criteria.

Such an approach encourages job-functional hands-on training, firm criteria of mastery, and individually paced progress.

Roe's Occupational Classification System

Level	Group							
	I. Service	II. Business Contact	III. Organization	IV. Technology	V. Outdoor	VI. Science	VII. General Cultural	VIII. Arts and Entertainment
1	Personal therapists Social work supervisors Counselors	Promoters	United States President and Cabinet officers Industrial tycoons International bankers	Inventive geniuses Consulting or chief engineers Ships' commanders	Consulting specialists	Research scientists University, college faculties Medical specialists Museum curators	Supreme Court Justices University, college faculties Prophets Scholars	Creative artists Performers, great Teachers, university equivalent Museum curators
2	Social workers Occupational therapists Probation, truant officers (with training)	Promoters Public relations counselors	Certified public accountants Business and government executives Union officials Brokers, average	Applied scientists Factory managers Ships' officers Engineers	Applied scientists Landowners and operators, large Landscape architects	Scientists, semi-independent Nurses Pharmacists Veterinarians	Editors Teachers, high school and elementary	Athletes Art Critics Designers Music arrangers
3	YMCA officials Detectives, police sergeants Welfare workers City inspectors	Salesmen: auto, bond, insurance, etc. Dealers, retail and wholesale Confidence men	Accountants, average Employment managers Owners, catering, dry-cleaning, etc.	Aviators Contractors Foremen (DOT I) Radio operators	County agents Farm owners Forest rangers Fish, game wardens	Technicians, medical, X-ray, museum Weather observers Chiropractors	Justices of the Peace Radio announcers Reporters Librarians	Ad writers Designers Interior decorators Showmen
4	Barbers Chefs Practical nurses Policemen	Auctioneers Buyers (DOT I) House canvassers Interviewers, poll	Cashiers Clerks, credit, express, etc. Foremen, warehouse Salesclerks	Blacksmiths Electricians Foremen (DOT II) Mechanics, average	Laboratory testers, dairy products, etc. Miners Oil well drillers	Technical assistants	Law clerks	Advertising artists Decorators, window, etc. Photographers Racing car drivers
5	Taxi drivers General houseworkers Waiters City firemen	Peddlers	Clerks, file, stock, etc. Notaries Runners Typists	Bulldozer operators Deliverymen Smelter workers Truck drivers	Gardeners Farm tenants Teamsters, cowpunchers Miner's helpers	Veterinary hospital attendants		Illustrators, greeting cards Showcard writers Stagehands
6	Chambermaids Hospital attendants Elevator operators Watchmen		Messenger boys	Helpers Laborers Wrappers Yardmen	Dairy hands Farm laborers Lumberjacks	Nontechnical helpers in scientific organization		

NOTE: Vertical dimension roughly represents status; horizontal dimension, situs.

Source: Roe, Anne. *The Psychology of Occupations,* © 1956, John Wiley & Sons, Inc., New York, 1956, p. 151

Figure 2

Researchers for the State of Oregon (12) basing their efforts on the above approach, analyzed a number of occupations and jobs and established the broad areas of Mechanical, Electrical, Spatial-Structural, Chemical-Biological, Symbolic, and People. They defined hierarchical levels of functioning similar to those described in the DOT, and defined a hierarchy of mental processes ranging from simple chaining (association) to problem solving. With these tools, they developed similarity indices between basic tasks, two at a time, and through statistical grouping developed related clusters.

Three clusters, drafting, mechanical repair, and electronic repair, are verbally described. Twenty-four clusters are described in terms of statistical loading tables, the underlying rationale of which is difficult to comprehend.

Their study is not broad enough to satisfy the premises we set for this project. It is concerned only with job-preparation for high school students. As far as can be determined, it was tried out on only one basic task in each occupation, not on the range of tasks comprising a job. While it provides a compelling example of the great detail and time required to construct even a few clusters, it seems bound to those few clusters. Its generalizability is not readily apparent.

An effort by Yagi, *et al.* (23) is related to this general approach, but with particular emphasis upon vocational curricular evaluation and construction. Borrowing from the job analysis scheme in Appendix A, Volume II of the DOT, they constructed a matrix (Figure 3) for classifying instructional objectives, covering three dimensions:

(1) Activity Area, or that aspect of the environment, things, data, or people, with which an activity is carried out.
(2) Level of Functioning, or a hierarchical definition of the degree of competence or complexity of the actions being accomplished with things, data, or people.
(3) Individual Characteristics, or identification of learning in terms of information, skills, and attitudes required for dealing at each level with things, data, or people.

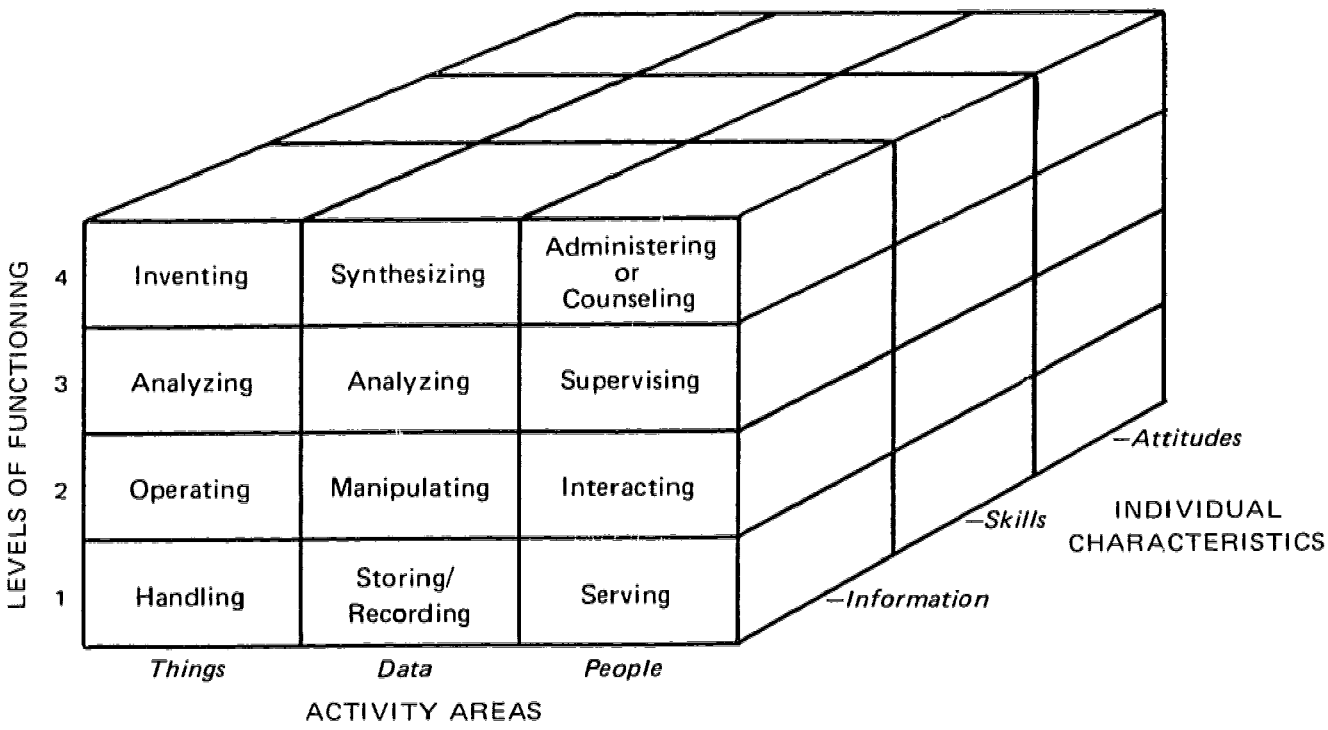
With this taxonomy, it became possible to locate training objectives without reference to course content and to provide a general guide for evaluating objectives or current courses, or for developing new objectives.

Empirical analysis of a new vocational curriculum of 14 courses in a large city school showed that the bulk of instructional objectives aimed at things and data (ignoring people), that things-oriented objectives were low in the hierarchy of functioning level (competence or complexity), and that objectives in the area of data extended to much higher functioning levels.

Further study was made in five ongoing courses over a school year, with the aim of determining shifts in level or in activity area that should occur over time, as reflected in activities and objectives. The fact that little change was found to actually occur over an entire school year illustrates the potential value of this approach for analyzing and evaluating both vocational and other curricula in terms of the task-derived objectives that are presumably being taught. Although this is not a clustering scheme, per se, it is closely related, and calls attention to the interaction between level of functioning and type of activity accomplished by workers, a point strongly made in the DOT.

The works of Maley and his staff at the University of Maryland (11), conducted over a period of several years, provide much valuable information regarding the task analysis approach. Maley's reports incorporate a review of work (much of it unpublished) to 1966, and a thorough coverage of the requirements, pitfalls, and advantages of task-analysis clustering. As he points out, this approach is aimed solely at the final preparation of a prospective worker for a family of similar jobs, and is not necessarily a feasible approach for a national or regional program (nor an approach for a more general occupational education and orientation throughout the secondary educational career).

Three-Dimensional Representation of Taxonomy



Sequence of Levels of Functioning in Each Activity Area of the Taxonomy

(in ascending order within area)

THINGS	DATA	PEOPLE	
Inventing	**Synthesizing**	**Administering**	**Counseling**
Design	Generalize	Manage	Treat
Create	Theorize	Negotiate	Mediate
Develop	Formulate	Formulate	Advise
			Educate
↑	↑	↖ ↗	
Analyzing	**Analyzing**	**Supervising**	
Test	Examine	Oversee	
Assay	Diagnose	Direct	
Troubleshoot	Classify		
↑	↑	↑	
Operating	**Manipulating**	**Interacting**	
Drive	Compute	Inform	
Control	Edit	Discuss	
Employ	Compile	Instruct	
Assemble	Translate	Persuade	
↑	↑	↑	
Handling	**Storing/ Recording**	**Serving**	
Clean	Register	Execute Orders	
Carry	Memorize	Take Instruction	
Stack	Sort	Assist	
Sort	Post	Comply	
Pack	List		

Source: Yagi, Kan, *et al. The Design and Evaluation of Vocational Technical Education Curricula Through Functional Job Analysis,* HumRRO Technical Report 71-15, June 1971.

Figure 3

Maley's original approach was not unlike the Oregon approach. General criteria for job inclusion, on such bases as mobility, favorable employment outlook, and advancement, were established, along with more specific criteria such as being within the traditional scope of vocational industrial education and being capable of immediate job-entry. After available classification systems were surveyed, the DOT and the *Occupational Outlook Handbook* were used in the initial identification of appropriate occupations.

Thirteen clusters were considered, although this was regarded as only the beginning of a list of possible clusters. A decision was made to limit the number. After further study, three clusters were selected for further investigation:

(a) Construction—Those occupations dealing with building a home.
(b) Metal Forming and Fabrication—Those occupations dealing with machining, forming, bending, and joining of metals.
(c) Electromechanical Installation and Repair—Those occupations dealing with the installation and repair of electrical and mechanical equipment found in homes and business offices.

Occupations within these clusters were reviewed to note those meeting criteria of school feasibility, favorable employment, job-entry availability, high commonality of skills, and job advancement. Relatively few occupations in each area satisfied these criteria and a total of 13 occupations were selected in the three major groups.

Task inventories were prepared and tasks were analyzed to determine the human requirements in each (skill, mathematics, measurement, science, communication, and information). From these, behavioral task statements were derived. Finally, through a procedure of comparing human requirements for each task statement, degrees of commonality for each of these requirements were tabulated in terms of being common to *all* occupations, *several* occupations, or only *one* occupation. Course outlines were developed from all these activities for the 13 occupations. By way of example for this sequence, the construction cluster consisted of five outlines: carpentry, electricity, masonry, painting, and plumbing. In several publications (24, 25, 26), Maley develops task analyses and course outlines for the three major areas of construction, metal forming and fabrication, and electromechanical installation and repair. These clusters are aimed at 11th and 12th grade students.

At this point, it is well to note a difference between this approach and the DOT approach. Essentially, the DOT and like systems are based upon job function or product; the task-analysis approaches are based on worker properties (skills, knowledges, actions). There is no question of the value of the task-analytic approach as an avenue to more efficient training for selected and specific entry-level clusters of occupations. Yet, in many ways, it is severely self-limiting. The population of clusters to be thus analyzed and developed is endless and the process is laborious. It is not conceptually developed with relation to a comprehensive 12-year curriculum. It does not at this time, or in the foreseeable future, provide a means of creating a general system covering many occupational areas and their vertical and horizontal interrelationships.

Although many people and institutions have worked at this type of clustering, they have covered only a minute area of the world of work. The method may be considered a valuable tool, specialized and limited, to be used near the end of the educational process, in studying highly specific fields of endeavor. Many of the limitations of the approach were discussed or portrayed by participants in a recent symposium on clustering reported by Cunningham (27).

(6) Related Systems. A number of institutions and individuals have been developing limited clustering systems for vocational-technical purposes for several years. Maley reviews programs in Pennsylvania, Massachusetts, Michigan, North Carolina, Nebraska, Missouri, and Indiana. Cunningham and his symposium members critically review others.

Rahmlow (15) describes procedures for identifying knowledge and competence clusters in a number of areas of work. Schill (28) describes curricular content for technical education in terms of core courses. Altman (29) has been concerned with the appropriate development of such courses. Gagne (30, 31) has long been concerned with the hierarchical nature of such learning, although extensive unpublished work at the HumRRO laboratory in Monterey demonstrates the difficulty of fitting this conceptualization to actual cases.

Other similar schemes were noted in our review of the literature or in personal correspondence. Thus, the Dallas Independent School District has instituted a major and extensive program for high school students around 27 occupational clusters (32). It seems clear that this program is essentially for career preparation for selected and able students, and is not a general curriculum.

All the schemes that have been noted are, by virtue of their basic concepts and purposes, aimed at late vocational-technical preparation for job entry, and *are not suited to a comprehensive curriculum.* Furthermore, perusal of these systems shows a fundamental lack of agreement on conceptual variables and criteria underlying their development, a point strongly made in Cunningham's discussions. In brief, in terms of our requirements, the task-related structures are seen as adjunct tools rather than conceptual systems.

From this review and from our own work in clustering and curriculum construction, it was concluded that no single system would cover the premises we had set up. Three approaches showed some promise in providing ideas or partial frameworks for our needs. They were the DOT system and related publications, the USOE set of clusters, and certain aspects of the Super and Roe categories. The development of these into a framework that could be integrated with a set of curricular processes is described in the following sections.

DEVELOPMENT OF INSTITUTIONAL AND OCCUPATIONAL MATRICES

While reviewing cluster systems and making initial attempts at constructing a multi-dimensional system, the research staff began to develop a system of curricular processes, which could be integrated with that system. The aim was to develop a *changing* total curricular system that would reflect the needs of the differing age populations and would reflect the changing objectives of the educational time span.

Gradually, a single multi-dimensional matrix came to be seen as too complex, too static, and as not responding sufficiently to the changing objectives for the different age populations. We decided to construct two bi-dimensional matrical systems, each to be integrated, in turn, with a third dynamic system of curricular processes.

With the emphasis in the lower grades on general awareness and information being provided very young children, the first matrix is structured upon what may be termed an *institutional* approach.. This matrix is presented in Appendix A. Here, the emphasis is not on job or occupation, but on the broad—in some ways regional—complexes such as public service, manufacturing, natural resources, commerce, communications, construction, and others. Such a broad orientation allows the most general and descriptive approach in early years; allows, but does not require, the selection of regional characteristics (agriculture, manufacturing, commerce, etc.) if these are seen as familiar starting points; and allows for the spiraling development of basic skills and knowledges on an increasingly wider scale in the accompanying curricular processes.

Twelve broad institutional areas make up one dimension; seven socioeconomic or status levels make up the other. This two-way table allows the development of occupations or groups of occupations, in as much detail as desired, using available sources from

USOE, Department of Labor, the *Occupational Outlook Handbook*, and other emerging "world-of-work" publications. Importantly, it clusters these broad or narrow occupational groups along the status dimension, allowing early development of a general appreciation of both the presence of general levels and some of the important concomitants of differing statuses. The actual number of institutional areas and status levels proposed for use in the curricular process ranges from two wide groupings in each dimension in early years to the full 12 x 7 matrix in later years.

The 12 institutional areas are derived from common sources, including the USOE headings, Census Bureau headings, and DOT classifications, as are the major subheadings in each. They have been rearranged and combined in an effort to keep the number within reason and to fit them to the purpose of curricular development. They have been cross-checked against the several sources and include present and emerging fields.

Like the originals, this system is mixed in some respects, sometimes stressing type of work, sometimes work-product, sometimes location or nature of the institution. The common thread, however, remains broadly institutional rather than occupational.[1]

The second matrix, intended to be integrated with curricular processes for upper-level students is more closely allied to an *occupational* or job-functional approach. It was strongly felt that this matrix must be based upon material widely available and well worked out. There is little question that Volume II and Supplements I and II of the DOT, with admitted deficiencies, is the only categorizing system that even approaches this requirement. It provides a comprehensive, inclusive general framework; it provides considerable detail; it takes personal characteristics and preparation into account; it is open-ended enough to allow for the addition of clearly emerging occupations, many of which will be variations of older skills; it in no way hinders the development of empirical and specific skill-clusters of the Maley type, should these be deemed necessary. This matrix is presented in Appendix B.

Major divisions of each of the nine Occupational Categories of Volume II, DOT, represent one dimension, the seven status levels represent the other. This juxtaposition portrays, more clearly than in the first matrix, the consistent clustering of broad families of occupations within given ranges of the status dimension.

The matrix in combination with the system of curricular processes allows early and easy identification of important implications regarding preparation for these different levels. It is intended that this matrix begin to complement the institutional matrix in the middle school years, providing a similar, but different, way of cross-cutting occupational groups, and allowing a counselor or student to note rather easily the place of a job family, such as a structural craft grouping in both the general field of construction (planning, architecture, engineering, crafts, labor) and in the specific array of crafts included in structural work (masonry, metal fabrication, electrical installation, etc.). In both instances, curricular, life, and career implications are brought readily into focus.

The DOT system, with its nine major categories, 80 or more divisions, and over 600 groups, allows as detailed a grouping as is desired. It further allows for consideration of worker function, worker characteristics, and level of activity. It is geared to other publications. This matrix is intended, as is the other matrix, for integration with the system of curricular processes to be described.

[1] It is well to note at this point, with regard to these matrices, that extensive efforts to describe the relative advantages of one clustering approach over another are, in the main, futile; the *only* systems in any way comprehensive and systematic are the government-sponsored efforts of many years' duration.

PROPOSED CLUSTERING SYSTEM FOR THE CCEM

DESCRIPTION AND FUNCTIONING

The clustering system proposed for the CCEM is a progressively developing one that incorporates (a) the main institutional job areas, (b) the career levels dimension, (c) the DOT functional occupational categories, and (d) the Awareness ⟶ Entry time dimension. Figure 4 presents a general representation of the system laid out along the K-12 grade levels.

As shown in Figure 4, the system calls for rather simple combinations of factors (a) and (b) at the Awareness level, a somewhat more detailed combination of the same two factors at the Orientation level, a detailed breakout of these two and a blending in of the third factor at the Exploration level, and a shift of emphasis loading heavily on the third factor, and deemphasizing the first two, at the Selection level. The grade levels (e.g., K-6) corresponding to Awareness ⟶ Entry on the vertical dimension are intended to be illustrative rather than hard and fast. The demarcation between Exploration and Selection, particularly, should be determined by the readiness of a given individual student to select and to begin specialization rather than by his particular grade level.

Figure 5 provides detail for the first two levels, Awareness and Orientation; Figure 6 provides detail for the levels of Exploration and Selection.

Figure 5 shows that, at the Awareness level, the system calls for collapsing all institutional areas into a simple dichotomy according to their involvement with the production of goods or services, and for collapsing all career levels into another dichotomy depicting their place ("lower" to "higher") along the continuum describing responsibility/income/status. All possible careers can be clustered in such dichotomous fashion without taxing the ability of elementary children to comprehend. An unlimited array of careers can thus be treated with coverage being expanded or contracted, depending upon various careers' relevance to the local socioeconomic context. Local option would determine where along the K-6 time line specific careers should be introduced into the system.

Figure 5 also shows that at the Orientation level the system calls for a somewhat more detailed clustering of careers along both the institutional area and career levels dimensions. By this time, the students will have been provided with a broad awareness of the spectrum of careers and of the general place of these careers on the levels dimension. Now they are ready for more detailed orientation as to the specific place of particular careers in the five general job areas and along the now trichotomized career level dimension.

At around this Orientation level, students begin to formulate their romanticized and idealized concepts of what they "want to be." This 3 x 5 clustering of the world of work provides a simple structure so that any student can become oriented as to where his metamorphosing career interests and income aspirations might place him in the overall socioeconomic structure.

The system provides the student with a realistic structure for orienting himself as to the implications of particular career choices. This simple clustering, still not overly categorized and subcategorized, and not beyond the ability of the typical student to comprehend, provides the potential for explicating the long-term implications (activities, lifestyle, income, status, autonomy) of the universe of career choices. The implications of becoming a teacher, of going into one's family business, of selling insurance, of becoming a dentist, of being a computer programmer, of being an airlines mechanic, can be made

apparent. This simple clustering provides the student with a realistic and systematic way of orienting himself (his interests, abilities, and aspirations) to the world of work, and with a simple way of conceptualizing various possibilities for his own career development.

The authors' view of the application of the system through the Awareness and Orientation levels calls for *all* students being provided the same exposure and learning experiences about the world of work.

Figure 6 depicts the system at the next levels of student development. At the Exploration level, the clustering system expands to its most detailed form. Here all 12 institutional areas (1-12) are employed, and the career level dimension is subdivided into seven levels (A-G) ranging from Laborer to Executive or Planner. At this level, then, careers are clustered according to a 7 x 12 matrix. It is sufficiently comprehensive that any job can be rather precisely located and described both as to institutional area and career level. This matrix, then, provides the student with a somewhat detailed, though still not complex, clustering system to use as a conceptual framework for viewing the world of work and for undertaking more detailed career exploration in the areas of his choice.

It is at this level that the need for the incorporation of the third factor, the nine DOT Occupational Categories (I-IX), becomes apparent. It is at this level (where detailed exploration of selected career options will occur) that the student must also have the information provided by overlaying the DOT categories, which group occupational areas by function, upon this structure.

Figure 6 also depicts how incorporation of the DOT functional categories provides another way of viewing broad possible career areas. Each DOT Category, when laid over the other two factors, encompasses certain unique combinations of the other two. For instance: (a) The DOT Category, Professional, Technical, and Managerial (DOT I) ranges across all 12 of the institutional job groupings and over the upper cells of the career levels dimension; (b) the DOT Category, Clerical and Sales (DOT II) includes almost all of the 12 institutional job areas and the lower-to-middle career levels; (c) many occupations from the DOT Miscellaneous Category (DOT IX) include only one job grouping and the lowest career levels.

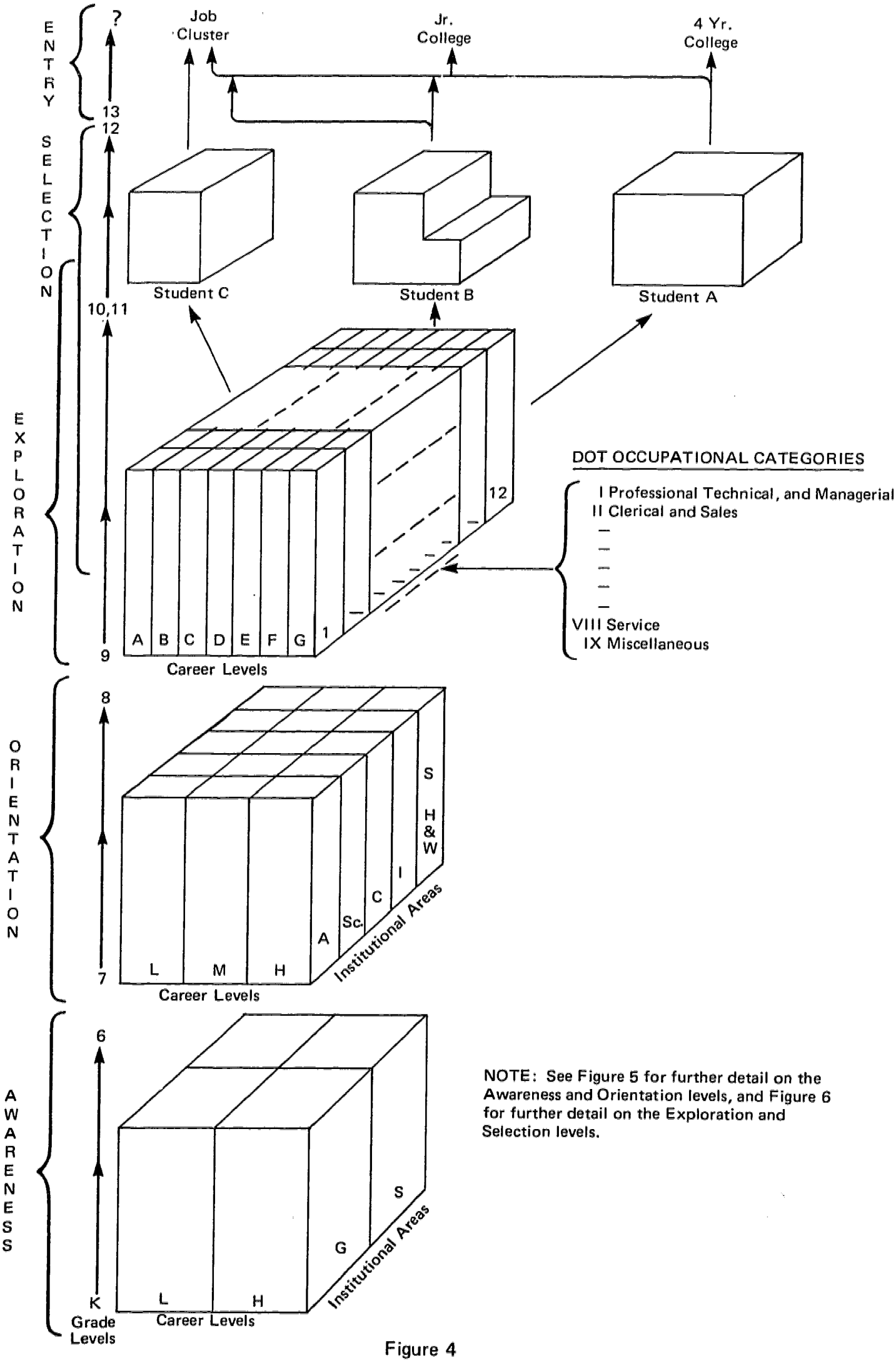
Further, and possibly most importantly, this phasing in of the DOT functional categories at the Exploration level brings the student to grips with what the DOT authors have termed Worker Traits Components. These components describe the abilities, personal traits, and individual characteristics required for successful job performance. Thus, the student learns the requirement of the various career options for education and training, aptitudes, interests, and so forth.

The insertion of this third factor into the clustering system provides the student with a convenient and readily understood vehicle for thinking about those arrays of career patterns that will provide him with the greatest number of options for exercising his abilities, interests, and educational and socioeconomic aspirations.

Figure 6 also illustrates how a given student might exercise his "exploration options." A student who knows he is job-bound after high school may elect to explore narrowly within one functional occupational category (DOT V), honing his career plans more and more finely as he proceeds (V′–V′′). Another, less decided, might explore in depth across two or more of the broad functional occupational categories (DOT I and II). All students would be encouraged to explore widely, keeping numerous options open as long as possible, rather than becoming committed prematurely to circumscribed, specific jobs.

At the Selection level in Figure 6, the diagram depicts how instructional content module combinations unique to a particular student might develop from the exploration

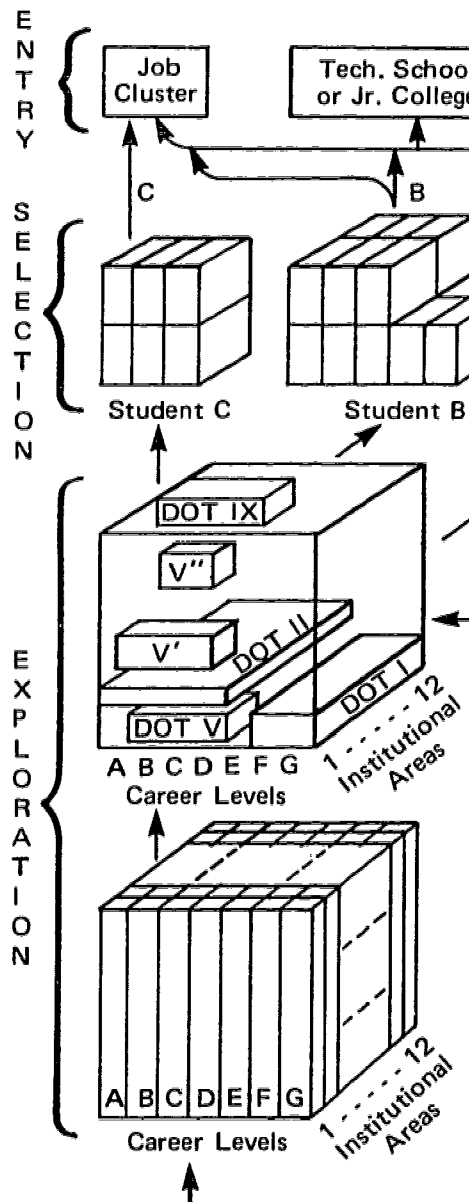
Clustering System for the CCEM



NOTE: See Figure 5 for further detail on the Awareness and Orientation levels, and Figure 6 for further detail on the Exploration and Selection levels.

Figure 4

Exploration and Selection Levels of CCEM



Schematic Representations of Different Two-Years Content Module Combinations for Three Hypothetical Students—A, B, and C.

DOT OCCUPATIONAL CATEGORIES

- I Professional, Technical, and Managerial
- II Clerical and Sales
- III Farming, Fishing, and Forestry
- IV Processing
- V Machine Tool
- VI Bench Work
- VII Structural Work
- VIII Service
- IX Miscellaneous

INSTITUTIONAL AREAS

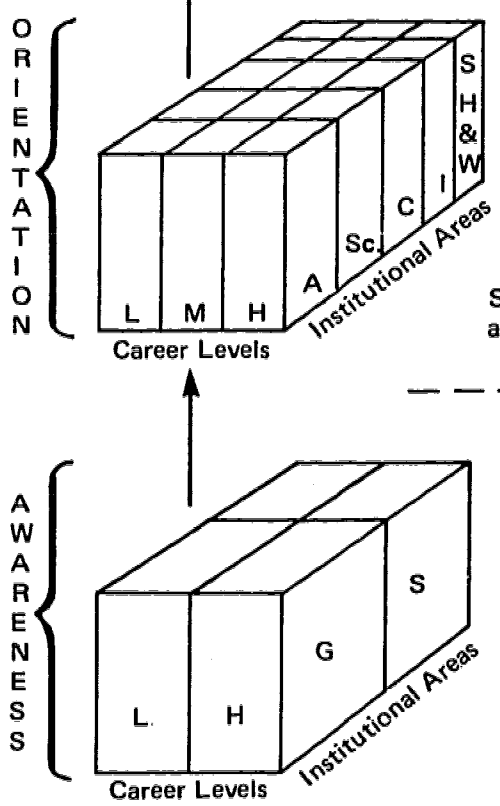
1. Public Service
2. Transportation
3. Manufacture
4. Natural Resources: Production
5. Natural Resources: Control
6. Commerce, Finance, Distribution
7. Communication and Media
8. Construction
9. Recreation
10. Arts and Humanities
11. Health and Welfare
12. Education and Research

CAREER LEVELS

- A. Assistant, Laborer, Helper (Unskilled)
- B. Machine Operator, Clerical (Semiskilled)
- C. Craftsman, Technician, Supervisor (Skilled)
- D. Official, Middle Manager, Semi-professional
- E. Semiprofessional, Professional
- F. Advanced Professional
- G. Executive, Upper-Level Manager, High-Level Planner

Figure 6

Awareness and Orientation Levels of CCEM



INSTITUTIONAL AREAS

Arts	7. Communication and Media; 10. Arts and Humanities
Science	5. Natural Resources: Control; 12. Education and Research
Commerce	2. Transportation; 6. Commerce, Finance, Distribution
Industry	3. Manufacture; 4. Natural Resources: Production; 8. Construction
Service, Health, and Welfare	1. Public Service; 9. Recreation; 11. Health and Welfare

CAREER LEVELS

Lower	A. Unskilled; B. Semiskilled; C. Skilled
Middle	D. Semiprofessional; E. Professional
Higher	F. Advanced Professional; G. Executive

INSTITUTIONAL AREAS

Goods	2. Transportation; 3. Manufacture; 4. Natural Resources: Production; 5. Natural Resources: Control; 6. Commerce, Finance, Distribution; 8. Construction
Services	1. Public Service; 7. Communication and Media; 9. Recreation; 10. Arts and Humanities; 11. Health and Welfare; 12. Education and Research

CAREER LEVELS

Lower	A. Unskilled; B. Semiskilled; C. Skilled; D. Semiprofessional
Higher	E. Professional; F. Advanced Professional; G. Executive

Figure 5

activities of the preceding level. Each of the three-dimensional stacks of cells represents the two-year Selection level program of study chosen by three hypothetical students who have formulated quite different career plans for themselves.

Student A has determined that his career interests are in the Architecture and Engineering group of the Professional, Technical, and Managerial Category (DOT I). He is undecided between studying architecture and civil engineering, but he knows that he has a good chance of going to college to become a professional. Therefore, he pursues the broadest possible curriculum to ensure that he meets academic college entrance requirements. At the same time, he is also leaving open the option of attending a junior college in case his college plans don't materialize. Circumstances might dictate that he pursue training toward becoming an architectural or engineering technician. He is including in his curriculum those specific math, technical, drafting and layout, communications, and interpersonal subjects that will qualify him for immediate entry-level employment with architectural, engineering, and probably a variety of industrial firms upon leaving high school. Thus, Student A keeps all his career options open, preparing himself at a minimum for entry-level employment in his chosen career area, with the possibilities for paraprofessional technical training or professional training being available depending upon the development of his interests, motivation, or finances.

Student B has determined that her career interests are likewise in the Professional, Technical Managerial Category (DOT I), but in the Medicine and Health group. Her explorations have led her to seriously consider nursing, dietetics, or medical or dental technology as equally possible careers. The knowledge she has acquired regarding the worker trait components required in these fields, matched up with her own interests, motivation, and financial prospects for education have led her to aim for the paraprofessional level, envisioning no more than two years of post high school training (junior college, hospital, or technical school). Although she has eliminated four-year college study as a possibility, wishing to keep all her other options open, she selects those subjects that will enable her to enter a junior college to pursue nursing (RN or LVN), dietetics, or medical/dental technology upon being graduated from high school. At the same time, to ensure that she has post high school employability, whether or not her plans for advanced training materialize, she selects those specific subjects (biology, health, etc.) that will prepare her for entry-level employment as a home health aide or as an aide in a hospital or clinic. Thus, Student B has chosen to delimit her options by excluding the possibility of attending a four-year college, but, at a minimum, she will prepare herself for entry-level employment in the career field of her selection. For her, the possibility of paraprofessional training beyond high school is highly probable, with the final choice of specific job cluster to be determined by where her developing interests lead.

Student C has been confirmed in his choice of career for some time and has explored and selected accordingly. For many years, he has spent his summer and holiday vacation time working in the family retail business. It is his firm intention to enter the business full time upon leaving high school, to continue to learn all aspects of the business on the job, and to take over the business upon his father's retirement. His career explorations have led him to consciously eliminate both junior and four-year college study as unnecessary for his career plans. He includes those courses of study in his curriculum (business math, retail merchandising, communication, interpersonal processes, etc.) that will afford him the broadest array of specific business-related skills and knowledge. Thus, Student C consciously restricts his post high school career/education options to one. His entry-level employability and his long-range career objectives are isomorphic.

In comparison to the lower levels of Awareness and Orientation, where all students would follow much the same instructional processes, the Exploration level would begin differentiating among students, and the Selection level would see each student pursuing his unique career/study curriculum.

SUMMARY AND GENERAL CURRICULUM IMPLICATIONS

The above described model for systematizing the world of work is seen as providing the basic curriculum framework for the CCEM. It is viewed as a significant step toward the solution of the following problems in our current public schools:

(1) Traditional vocational training is oriented toward a static job market and job preparation that is too narrow and single-job specific.

(2) The public schools generally do not provide a comprehensive variety of broad and flexible career development options.

(3) Young adults of school age perceive disparities between the school activities required of them and the world in which they will be functioning. To them there seems to be a great deal of irrelevance in their educational programs.

(4) Students are generally required to choose between vocational and academic goals, thus making career decisions too early and without sufficient knowledge of their own abilities, interests, *and* the world of work.

(5) Vocational education, as currently offered, does not enjoy full acceptance among many educators, students, or parents. Minority groups, particularly, tend to shun that which they perceive to be second-class educational preparation.

This structure is in consonance with the objective of the CCEM to revise the public school curriculum to fit the unique requirements of individuals. It is intended to serve as a structure that will make the curriculum flexible and adjustable so that all students can find employment with or without the benefits of college study. It will provide the real-world context through which integrated and comprehensive curriculum processes will flow, providing all high school graduates with the qualifications for maximum post-high school flexibility. Its salient feature is that no option—four-year degree study, community college, technical school occupational training, or entry into the job market—is arbitrarily closed to any student prior to high school graduation.

It is well to point out here that although all students would be encouraged to acquire the broadest and most flexible occupational base, and to delay firm career decisions as long as possible, this is not meant to imply that single-job training would not be available for the student who is confirmed in his or her choice of a circumscribed career. For those who have made early career decisions, the option of early specialization should be available (Student C as sketched above).

The curriculum would eliminate the academic-vocational dichotomy, and provide a wide variety of career-preparation options to all students. Over time, academic-vocational subject distinctions would fade with the traditional "academic" subjects being interfused with the "nonacademic." The current "academic" and "nonacademic" subjects would be taught with direct application and relevance to each other.

As much as possible, instruction would be cast in comprehensive functional modules (measurement, personnel interactions, problem solving, etc.), rather than by discipline subject matter block.. Mastery would be adopted as the criterion for advancement within a given instructional sequence, eliminating the practice of assessing a given student's learning performance in terms of his relative position in a group distribution of grades.

Evaluation would be in terms of a given student's attainment of instructional objectives regardless of the performance of his classmates or what prior formal instruction he has had. This would tend to break the grade-by-grade, group instructional lockstep, allowing individual students to pursue instruction accommodating their individual learning styles. Thus, a more meaningful incentive system for pursuing instruction would evolve.

STUDENT INFORMATION AND GUIDANCE

The discussion of the previous section treated the general implications of the system for curriculum content and process exclusively. Consideration of the proposed system leads us to conclude that it is equally useful as the basis for organizing student information and guidance programs. It provides a systematic, comprehensive, and not too complex framework for organizing job-market information, for charting trends, and for comparing local, regional, and national opportunities. At any point along the educational growth line, the student has a framework for comprehending, sorting, and storing his growing body of information about the world of work, his developing aspirations, and the guidance he receives in regard to bringing them together.

IMPLICATIONS OF CLUSTER SYSTEMS FOR THE DESIGN OF INSTRUCTION

This section will relate the use of clustering systems for the design of instruction of the entire K-12 sequence. Clustering systems can offer a major planning vehicle for preparing student-learning experiences, but they cannot be used as the sole input for the total curriculum. There are two important reasons for this qualification.

The first reason is that there lies at the base of all education the instruction in cognitive skills. They are the broad-base tool skills—reading, writing, and arithmetic—which are applicable in myriad contexts. We use them to gather information, communicate with other people, and function in our daily lives. To equip students with these skills is to prepare them implicitly for future social and occupational roles.

The second reason arises from the structure of higher educational institutions. They serve as the major doorkeepers to many careers, especially those in the professions. The curriculum they stipulate for entry determines to a large extent the structure of high school offerings. The student without that academic preparation cannot have entry into higher education and therefore into our society's most remunerative and prestigious occupations.

These two inputs into the K-12 curriculum—instruction in cognitive skills and the relationship of higher educational institutions to career entry—obviously cannot be ignored in adapting K-12 curriculum for career education.

CLUSTERING SYSTEMS AS A MAJOR INPUT INTO THE DESIGN OF INSTRUCTION

The past use of clustering systems in an educational context has been confined to vocational education, usually to the last two years of high school training. The student receives, for the most part, training in specific job skills that will allow him entry into a series of specific jobs. A less common variation is to furnish the student with various broad skills that he can apply in several job contexts or situations.

We cannot expand this limited use of clustering systems by simply extending such use to the general K-12 instructional sequence. Too much is lacking for career development: The means by which students acquire information about careers are missing, as are the means by which a student can relate his personal goals, needs, and talents to possible career roles.

Because there have been few actual applications in schools, the conceptual base that might have arisen from past educational use of clustering systems cannot be borrowed to design an entire K-12 curriculum. We have combined clustering systems that were originally conceived for noneducational purposes in order to arrive at an inclusive system, usable in a general education context.

If a clustering system is to serve as a major input into instructional design, it must be useful in three ways:

(1) To provide students with accurate and comprehensive information about what it means to work.

(2) To provide a set of learning experiences against which a student can weigh his personal interests, needs, and talents in order to arrive at a candidate set of careers for his future adult roles.

(3) To provide planning models that will help shape the general curriculum in terms of instructional objectives, content, and methods.

No clustering system is presently in operation that fulfills the three instructional functions—*information*, *guidance*, and *curriculum planning*. To design a system meeting

these requirements meant that an unidimensional or single method of clustering had to be rejected. It would be too inflexible and confining. Only a set of multidimensional clusters would solve the problem imposed by the three functions.

The Dimensions of the Proposed Clustering System

The dimensions of the proposed clustering system, discussed at length in the previous sections, address the requirements of the three functions. The dimension of career levels stresses the need to provide learning experiences offering information to students about the impact of careers on personal life style and social status. The dimension of career areas stresses job content and function.

Learning experiences prepared along this dimension at first acquaint students with occupational roles and relate the skills and capabilities they acquire to occupational areas. As they advance toward career selection, more and more of their learning experiences are directed toward preparation in skills and knowledges needed for job entry. Thus, the instructional system must establish a basis for career selection through information and guidance and provide concrete skills and abilities for job entry through the curriculum.

The proposed clustering system is only one major source of the curriculum content. Because the outcomes of the CCEM are open-ended—the student can opt for job entry, college entry, post-secondary training, or any combination of these—the curriculum content is defined by the entry requirements of higher educational institutions, business, industry, and unions. The clustering system makes its largest input into the curriculum content by translating the skills and knowledges needed for job entry into learning experiences.

The essential role of the proposed clustering system is that of a planning vehicle. From it arises the means to plan learning experiences centered around career information and guidance. It also provides the means to derive the content necessary for job entry.

The Necessity of Coordinating the Clustering System Within a Curriculum Structure

Since the clustering system serves chiefly as a planning guide, its inputs to the K-12 curriculum have to be placed within a curriculum structure that can accommodate them within the present organization of elementary and high schools.

Past attempts at translating job clusters into curriculum content have relied heavily upon general learning taxonomies, such as those proposed by Bloom (33), Gagne (31), and Fine (34). The purpose of these taxonomies is to cohere and sequence the learning experiences derived from a task analysis of job skills. Fine, for example, regards the categories of "Data, People, and Things" as a way to structure job skills for learning purposes. Any job task is to be placed within one of these categories, and it can be assigned to a hierarchy within the category, depending upon the degree of complexity of the skill. Under the "Data" category, a skill such as checking two sheets of numbers to see whether any mistakes were made in transcribing would be assigned to the lowest level—"Comparing." Bloom and Gagne have similar classificatory schemes prepared for cognitive skills and all learning, respectively, which can be applied to a task analysis of jobs.

These taxonomies have limited application to the present problem. First of all, a task-analytic approach to clustering jobs on the basis of common learning requirements has had only a few empirical examples in a severely limited set of occupations. The prior research that is a necessary antecedent to the broad educational use of these taxonomies has not been accomplished. Secondly, the use of these taxonomies has been confined to

training in skills leading to immediate job entry, usually in programs of short duration. Job entry is only one of several outcomes of the CCEM. Awareness, Orientation, Exploration, and Selection are prior goals that the curriculum structure must address to realize career development. These taxonomies cannot provide a curriculum structure usable throughout the K-12 grades.

A series of constraints are imposed by the nature of the school-based model. Since the CCEM is to function within the present school system and its institutional arrangements without severe displacements, a curriculum structure must be devised that is in harmony with the present organization of school—certainly not one that is antagonistic to its institutional arrangements. These constraints alone would mitigate against the use of theoretical taxonomical structures. They have not been validated empirically, and to recommend the thorough and radical reorientation they would demand in terms of time, money, and additional physical resources would be to complicate a complex undertaking with unnecessary variables.

The curriculum structure that will be discussed in the next section is proposed as a means for adapting the present curriculum structure to career education with minimal displacements. It takes into account the goals and outcomes of the CCEM, the present institutional arrangements of schools, and the range of probable inputs influencing the content of the curriculum.

THE NINE PROCESSES DETERMINING THE STRUCTURE OF CURRICULUM

It is proposed that the learning experiences that will equip students to meet one or several of the multiple outcomes can be contained within nine educational processes:

(1) Communication
(2) Social, Political and Economic
(3) Art
(4) Tool and Handcraft
(5) Physical Development
(6) Interpersonal
(7) Mathematical
(8) Scientific
(9) Technological.

Groups of skills and capabilities that students need for career entry can be placed into the processes, once the students have chosen a set of careers or a specific career to follow. The processes can contain the content students need for college entry. Additionally, the processes can contain learning experiences that are coordinated with the progression that the CCEM has stipulated for career development: Awareness, Orientation, Exploration, and Selection. Most importantly, the proposed clustering system can work in conjunction with the processes to plan learning experiences that guide, inform, and equip students for the world of work.

The term "processes" has been chosen because it best conveys the nature and type of learning that should occur. We conceive of the learner as actively engaged in the processes of learning, where the importance of specific content acquisition is secondary to what the content enables the learner to do. Acquisition of scientific facts and concepts are not ends in themselves, but are tools that the learner can use to investigate and solve problems. Under this process approach, career development can be integrated with the instructional program. The student, in using the conceptual tools of science to solve problems, learns an important aspect of what scientists do as a function of their careers.

More than anything else, the process stresses an orientation rather than a pure category system for nine areas of learning. A pure category system is not possible for several reasons. Learning in certain areas, especially in the sciences and mathematics, has been organized into formal disciplines, and careers are built upon these disciplines. To be a physicist, chemist, or mathematician requires pursuit within the discipline and its organized body of methodology and knowledge. Acquiring cognitive skills that are generic in their application to many contexts constitutes another subdivision of learning processes. Finally, career specific processes—working with tools and machinery and applying various intellectual techniques in a work context—define another grouping of learning processes.

Because we cannot organize the content of the curriculum into homogeneous categories, the nine processes must reflect the differences among different kinds of content the student is to learn. However, the use of the term, process, underscores the need for arranging instructional objectives and methods that allow the student to be an active participant in the learning activity. With the perspective that the term implies, the career context falls in as a matter of course. The things a student learns to do have a real and functional context: what it presently enables him to do and what it will enable him to do in future social roles. Moreover, because of the career context, he continually sees the relationship of people working in various career areas to those skills and knowledges he presently is acquiring.

Separate outlines of the proposed organization of these processes for instructional design are provided in Appendix C. Figure 7 sketches the general use of these processes as a curriculum model. During grades K-6, the nine processes are combined into six main tracks. Communication and Social, Political and Economic processes are combined into one track. Mathematical, Scientific, and Economic processes are also grouped together into another track. The other four processes are on separate tracks. During grades 7-8, the only grouping is to combine Scientific and Technological processes. During grades 9-10 each process forms its own track.

Each process is seen as containing much of the content that presently is taught in elementary and high schools. Three of them were added to include content from career areas not generally present in elementary schools and the first two years of high school. These are Tool and Handcraft, Interpersonal, and Technological.

The nine processes work in three general ways to define the content of the curriculum. In grades K-8, they define the content that all students are to be taught. During the Exploration phase in grades 9 and 10, although students remain within all nine processes, they can choose subdivisions of the nine processes for in-depth exploration. During the Selection phase in grades 11 and 12, where multiple branching of each track is shown in Figure 7, instructional modules can be developed from specific career entry, continuing college entry, and post secondary entry contents. Each of these contents can then be placed within the appropriate process as an instructional module.

The conceptual framework on which the processes were designed essentially sees the tracks as spirals of evolving skills and abilities, during the years K-10. Initially, the students acquire a skill or new knowledge in the most global context. As they progress, the skills and capabilities are further honed in more complex sitatutions, calling for finer manipulations and applications.

Tracing through one of the processes can serve as a concrete example of the spiral-like evolution of skill and abilities—the Social, Political, and Economic process.

During the K-6 phase, students would be introduced to the basic concepts and methods of looking at man, his past, his culture, and society. They would acquire, in simplest terms, the concepts of society, culture, and political systems. As they move beyond the beginning uses of these concepts, their capabilities would evolve as they confront more sophisticated problems and situations.

Use of the Nine Processes to Structure a Curriculum

- A. Business Communications
- B. Foreign Languages
- C. Literature
- D. Improvement of Reception & Translatable Mission Skills

- A. History
- B. Anthropology
- C. Sociology
- D. Psychology

- A. Performing Arts
- B. Plastic Arts
- C. Verbal Arts
- D. Technological Arts

- A. Woodworking
- B. Metalworking
- C. Landscaping & Gardening
- D. Drafting & Layout
- E. Masonry & Bricklaying

- A. Individual Sports
- B. Team Sports

- A. Negotiating, Bargaining, Sales
- B. Managing Groups
- C. Education & Training
- D. Problem-Solving & Advising

- A. Technical Measurement
- B. Computer Applications
- C. Advanced Mathematical Systems

- A. Life Sciences
- B. Natural Sciences
- C. Physical Sciences

- A. Business Machine Operation
- B. Production Machine Tool Operation
- C. Machine Installation Operation & Repair
- D. Computer Operation
- E. Electronics

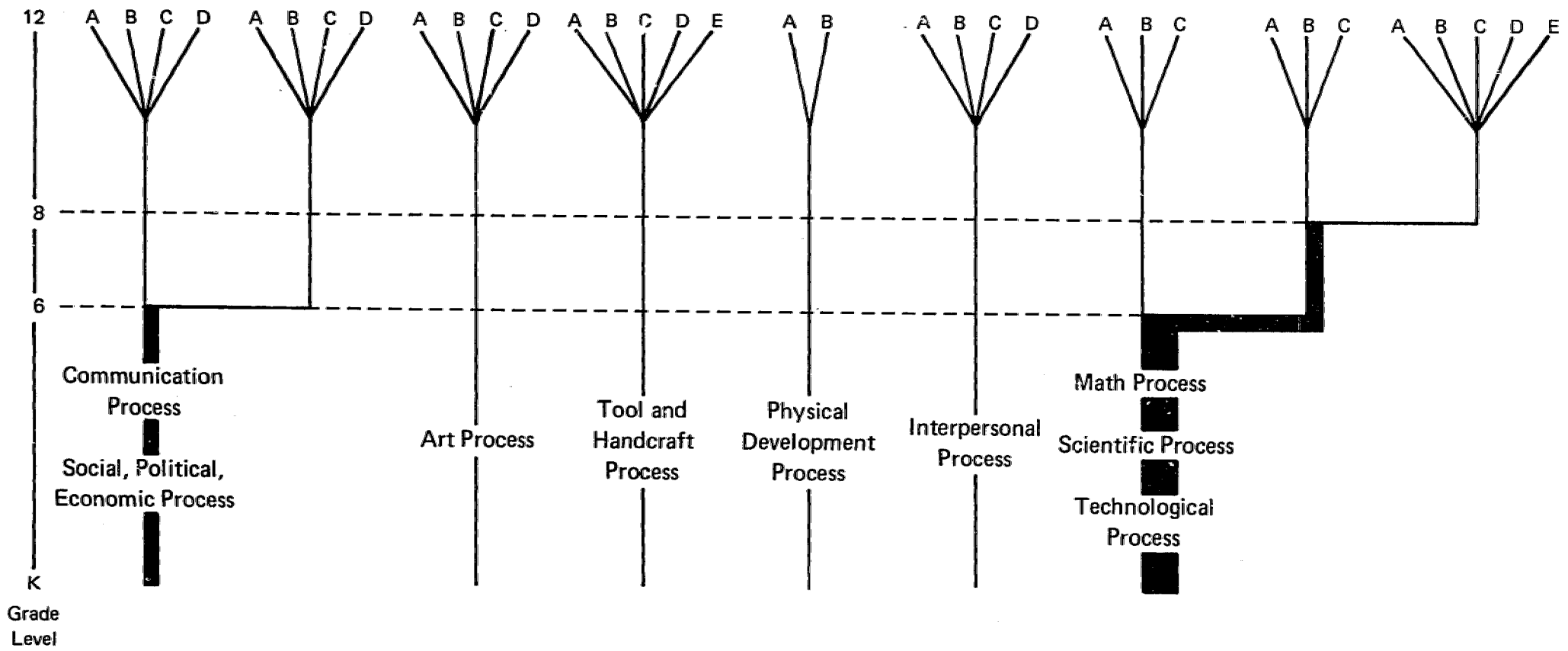


Figure 7

In grades 7-8, students would be introduced to the social science disciplines of History, Anthropology, Archeology, Sociology, Political Science, and Psychology. Their past investigations—looking at data, comparing and verifying information, interpreting events and behavior—are placed into the confines of an appropriate discipline. At this time, skills used globally at the onset become more specific and tied to the organization and structure of the discipline. They learn that historians use certain conceptual tools in examining the past, while anthropologists, political scientists, and sociologists employ others.

In grades 9-10, students can explore among these disciplines in depth, depending upon their personal interests. They could explore, for example, various careers that use these disciplines as their center.

Finally, a caution. The outlines given in Appendix C are suggested general arrangements of these processes, not necessarily final in detail. They should be considered general recommendations of how to resolve the inclusion of contents arriving from various sources into a curriculum model.

RELATION OF THE CLUSTERING SYSTEM TO THE NINE PROCESSES

A collapsed clustering system is proposed in the Awareness phase, K-6, as shown in Figures 4 and 5. Occupations are arranged into two groups: those concerned with production of goods, and services. Career levels are placed into two categories: higher and lower.

The clustering system provides a simple context for the learning experiences to be included within the processes. Under artistic processes, for example, working with various media can include simple schemes for introducing artists and general information about their lives and functions. The necessary dimension that the clustering system interjects into the nine processes during the Awareness phase is the general relationship of what is learned to concrete areas of human activity.

At the Orientation level, the clustering system grows in detail, as Figures 4 and 5 illustrate. Career status is now divided into three levels and occupations into five broad areas. Building upon the general relationship of careers to the nine processes, learning experiences can now begin to focus the students' personal interests and needs. The clustering system provides a conceptual structure that leads the student to see how the skills and knowledge he is acquiring fit in with demarcated occupations within five broad areas. The learning experiences can lead the student to realize how pursuit of skills and knowledge within the nine processes lead to specific careers in the five areas. The relationship between the clustering system and the processes has not intrinsically changed from the Awareness level. The input is still directed toward guidance and information about career development.

The clustering system is at full bloom at the Exploration phase (9-10), as depicted in Figures 4 and 6. Career levels and areas are placed in a 7 x 12 matrix. Here an additional categorization system is introduced, grouping occupations by broad function. As students choose possible careers, which they will explore in depth, the implications of their choice are fully dimensionalized for them in terms of status, educational requirements, and array of options. Exploration of careers also implies that students will begin to select learning experiences within the processes. To prevent premature choice and later regret, the students should continue to have learning experiences with each process. They can, for example, have the option to explore certain careers in depth within the content of the nine processes.

At this time, the nature of the input that the clustering system makes becomes expanded. While its influence remains tied with guidance and information, the need becomes apparent for arranging exploration experiences so that students can see the implications of selecting among various career options.

During the concluding Selection phase, the student chooses one, or a combination, of the outcomes available to him. In the earlier phases, the input of the clustering system was to help plan learning experiences that would guide and inform the students about the world of work and the many important variables associated with making a career choice. At this point, now that students have made a choice, the clustering system becomes the source of the specific content students need for direct entry to jobs. Additional curriculum contents can be drawn from junior and four-year college entry requirements, and from post-secondary specialized schools, for those students who have chosen careers requiring an education beyond high school.

These contents can be placed in one of the branches of the nine processes, in the form of instructional modules. The arrangement of all contents into modules permit a highly individualized curriculum. Any combination of outcomes can be chosen by a student. One student may want to prepare exclusively for direct entry in several jobs that are unrelated, because they are congruent with his personal interests and talents. Another student may choose to prepare for both college and job entry—college entry becuase it is the path to a career, job entry because he must work summers and part-time to pay for his education. These are only two of the many possible arrangements of outcomes particular students can choose.

The clustering system during the Selection phase shifts its impact on the education of students. For those students who have chosen direct job entry after high school, instruction has to be provided in the complex of skills and knowledges needed to make entry possible. The usual solution has been to separate those students and place them into a vocational track. The arrangement on the job contents derived from the clustering system into instructional modules permits all students to pursue job entry. It ends the depressing choice students have to make between entrance into one of two tracks, vocational and academic. It also permits students to choose among multiple outcomes and pursue highly individualized courses of study.

SUMMARY

We have recommended the use of nine processes as the means to place instructional content arriving from various sources—basal cognitive skills, job-entry skills, higher educational entry requirements—into a general curriculum model. The use of the term "process" is oriented toward instructional objectives and the arrangement of learning experiences. The learner would acquire skills and capabilities as a result of engagements and confrontations with the learning material. The evolution of the acquisition of skills and capabilities should occur in a spiral arrangement, moving from global to specific, elaborated conceptual systems, and from simple to complex manipulations and applications.

The clustering system serves as a planning model, integrated with the progression of career development goals: Awareness, Orientation, Exploration, and Selection. The clustering system makes three major inputs into the curriculum model. During the Awareness, Orientation, and Exploration phases, the major inputs are to the functions of information and guidance. The clustering system can serve as the basis for arranging instructional objectives, content, and methods that guide and inform students about the world of work. In the Selection phase, job skills can be derived from the clustering system and, in turn, are translated into instructional modules. These modules can be placed into the appropriate process, together with other modules derived from other contents. Thus, an individualized curriculum can be built where students can prepare for single or multiple outcomes of their own choosing.

The outlines presented in Appendix C and Figure 7 are general recommendations as to the arrangement and content of the nine processes. They should not be considered definitive and complete in detail. They are offered simple as a takeoff point from which to develop a comprehensive model of the curriculum. This process structure takes into account the goals and projected outcomes of the CCEM, and the present organization of schools, and is coordinated with the clustering system.

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AND
APPENDICES

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Appendix A

INSTITUTIONAL FIELDS

Fields:	MASTER SHEET – INSTITUTIONAL FIELDS						
I. Public Service–Governmental							
II. Transportation							
III. Manufacturing							
IV. Natural Resources–Production							
V. Resources–Control and Conservation							
VI. Commerce and Trade							
VII. Communication and Media							
VIII. Construction							
IX. Personal Development and Recreation							
X. Creative Arts							
XI. Health, Family and Public Welfare							
XII. Education, Training and Research							
Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

I		PUBLIC SERVICE (GOVERNMENT, STATE, DISTRICT, ETC.)						
	Revenue Disbursement	Clerk	Keypuncher Clerk	Programmer	Programmer	Accountant	Economist Statistician Mathematician	
Post Office		Clerk Sorter	Clerk Carrier	Supervisor	Inspector	Postmaster	District Executive	
Public Control Regulation	Legal Control and Correction Monitoring Licensing	Clerk Guard Clerk Clerk	Patrolman Records Clerk	Detective	Police Captain Office Manager	Criminologist	Attorney	
Defense	Combat Soldier Technical Support Command and Admin		NCO or Specialist	Senior NCO or Specialist	Senior NCO or Specialist	Warrant Officer Technical	Officer Technical or Command	
Political and Appointive Office				Precinct Committee- man	Mayor Councilman	District Engineer	State Superintendent of Instruction	
Construction and Planning	Highways Urban Renewal Rural Renewal					Engineer	Urban Designers Highway Designers	
Public Utilities	Sanitation Transportation	Refuse Collector	Driver	Laboratory Technician	Plant Operator	County Sanitary Engineer	Regional Director	
Health and Welfare		Aide	Records Clerk	X-Ray Technician	Ward Nurse	Head Nurse Social Worker	Physician Scientist Hospital Administrator	
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

II		TRANSPORTATION						
Aerospace		Baggage Handler	Counter Clerk Baggage Clerk Steward	Mechanic Electrician Communication Technician	Station Manager Traffic Controller	Pilot Navigator Engineer	Space Physicist Biologist	
Road and Highway	Local	Loader Washer	Driver Routeman Clerk	Mechanic Body Man Agent	Dispatcher Manager			
	Distance	Helper		Driver	Dispatcher Driving Supervisor			
Rail		Track Laborer	Clerk	Sheet-Metal Worker Brakeman Signal Worker Boiler Maker	Locomotive Engineer Conductor	Civil Engineer		
Water		Seaman		Boatswain Electrician Steward	Engineer Purser	Chief Engineer Chief Mate Pilot	Captain	
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

III		MANUFACTURING *(Continued)*						
Light and/or Non-Durable Products	Foods	Grain Grinder Tender	Distillery Millman Helper	Baker Fruit Coordinator	Sugar House Foreman	Nutritionist	Chemist	
	Apparel Textiles	Helper	Sewing Machine Operator	Marker Cutter	Patternmaker	Designer		
	Petroleum Products	Helper	Pumpman	Pipe Fitter	Stillman	Petroleum Engineer	Chemist	
	Paper Products	Loader Helper	Envelope Machine Operator	Paper Machine Operator Paper Tester	Stationary Engineer	Chemical Engineer	Forest Manager Chemist	
	Nuclear Energy		Waste-Disposal Man	Radiation Monitor	Reactor Operator	Engineer	Physicist Mathematician	
	Electrical Energy	Laborer	Gas Leak Inspector	Load Checker	Rectifier Operator	Engineer	Physicist	
	Plastics Synthetics	Laborer	Caster	Plastics Fabricator	Internal Carver	Engineer	Chemist	
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

III		MANUFACTURING						
Primary Heavy Materials Production	Metal	Laborer Cleanup Man	Cinderman Third Helper	Keeper Lab Technician	Blower Melter Craneman	Mechanical Engineer Accountant	Chemist Lawyer	
	Industiral Chemicals Plastics	Barrel Filler	Chemical Operator Helper	Lab Technician Machinist Instrument Repairman	Chemical Operator	Chemical Engineer	Chemist Plant Designer	
Heavy and/or Durable Products	Foundries	Core Setter	Mold Maker	Molder	Die-Casting Foreman			
	Auto	Assembler	Lab Assistant Trimmer	Draftsman	Tool and Die Maker	Electrical Engineer Mechanical Engineer	Metallurgist Physicist Designer	
	Aircraft	Assembler	Assembler Clerk	Machinist Riveter Welder	Sheet Metal Worker	Assembly Inspector Engineer		
	Heavy Equipment	Drum Straightener	Former Helper	Forging Heater	Structural Mill Foreman	Engineer	Metals Researcher	
	Electrical Equipment	Coil Winder	Quality Control Inspector	Transformer Man	Electric Motor Analyst	Engineer		
	Fabricated Metals	Sorter	Bearing Inspector	Machine Assembler	Patternmaker			
	Wood Products	Sand Nailer	Hand Shaper	Layout Man	Fabrication Foreman			
	Mineral Products	Gold Burnisher	Model Maker	Layout Man	Glass Blower			
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

(Continued)

IV		NATURAL RESOURCES–PRODUCTION						
Agriculture	Farming Agri-Business Research Agri-Services	Farm Laborer	Tractor Operator	Field Foreman	Farm Owner or Manager	Agricultural Engineer County Agent	Agronomist Oenologist Soil Scientist	
Mining and Extraction	Extraction Processing Research	Drill Operator Helper	Rotary Drill Operator	Mechanic	Field Foreman Plant Operator	Mining Engineer	Geologist	
Marine	Fishing Processing Research Marine Service	Wharf Hand	Mussel Fisherman	Rigging Scow Foreman	Hatchery Foreman	Ship Engineer Inspector	Fishery Bacteriologist Marine Biologist	
Forestry	Farming Processing Research Forestry Services		Forester Aid	Fire Warden	Woods Boss	District Manager	Forest Ecologist Research Horticulturalist	
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

V		RESOURCES—CONTROL AND CONSERVATION						
Lands Soils Minerals	Research Monitoring Control Services		Draftsman	Soils Technician	Inspector	Soil Conservationist	Ecologist Physicist Geologist	
Forests	Research Monitoring Control Services		Tree Planter	Forestry Aid	Fire Warden	Forest Ranger	Ecologist Biologist	
Water	Research Monitoring Control Services			Laboratory Technician Inspector Mechanic	Waste Plant Operator	Sanitary Engineer Health Officer	Bacteriologist Chemist Oceanographer	
Atmosphere	Research Monitoring Control Services			Smoke Emission Inspector	Radiation Monitor	Nuclear Engineer Mechanical Engineer	Meterologist Physicist	
Man-Made Environment	Urban Planning Rural Planning (see above) Waste Control and Monitoring Noise Control and Monitoring Research			Audio Technician	Inspector	Landscape Architect Civil Engineer Agricultural Researcher	Chemist Urban Planner	
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

VI		COMMERCE AND TRADE						
Business and Office	Records Clerical Secretarial Administrative	Clerk	Typist Clerk	Secretary Computer Operator Office Machine Operator	Manager	Accountant Analyst Manager	Systems Analyst Personnel Researcher	
Finance	Banking Credit Insurance	Clerk	Teller Bank Clerk	Tabulating Machine Operator Computer Operator	Head Teller Department Manager	Loan Officer Operations Officer	Statistician Actuary	
Marketing	Marketing Research Advertising (see Table VII) Sales-Wholesale Sales-Retail	Vendor	Parts Counterman Retail Sales Clerk	Auto Service Writer	Retail Sales Manager Technical Writer Buyer	Farm Broker Manufacturer's Representative Buyer	Advertising Researcher Psychologist Securities Market Analyst	
Storing and Distribution	Storage Product Transport	Laborer	Lift Operator Driver	Foreman	Warehouse Manager			
Service Trades	Personal Services Maintenance and Repair Business Services	Busboy Main	Waiter Barber Beautician Security Guard	Auto Mechanic TV Technician Cook	Motel Proprietor Laundry Proprietor Chef	Head Chef Embalmer Restaurant Manager		
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

VII		COMMUNICATION AND MEDIA						
Telegraph and Telephone	Research-Development Line Work Equipment Installation Central Office Operators		Clerk Operator	Switchman Splicer Lineman	Central Office Repairman Foreman	Electrical Engineer Branch Manager	Physicist	
Radio and Television	Engineering: Electronic Electromechanical Systems Programming and Production Research—Development	Helper Floorman	Sound Effects Man	Continuity Writer Maintenance Technician Electronics Repairman	Personnel Administrator Announcer	Engineer Program Director Producer	Physicist	
Publishing	Graphic Arts Journalism		Assistant Pressman	Photoengraver Binder Pressman	Foreman Technical Writer Reporter	Assistant Editor Journalist Researcher	Publisher Editor	
Advertising			Clerk	Copywriter	Production Manager	Advertising Manager Account Executive	Research Director Statistician	
Audio-Visual Production	Audio Production Photo and Film Production		Film Splicer Script Clerk	Set Electrician Sound Installation Man	Special Effects Foreman	Musical Director Recording Engineer	Director Electronics Engineer	
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

VIII		CONSTRUCTION						
Design and Planning	Architectural	Laborer	Craft Apprentice	Plumbing Draftsman Heating Draftsman Power Draftsman Illustrator	Chief Draftsman	Architect Cartographer		
	Engineering					Civil Engineer Cost Accountant		
Marine Construction	Shipyard	Laborer	Craft Apprentice	Boilermaker Specification Writer	Hydraulic Draftsman Riggers	Marine Architect Marine Engineer		
	Offshore							
	Underwater							
Land Construction	Highways	Laborer	Craft Apprentice	Reinforcing Iron Worker Mason Shovel Operator Carpenter	Surveyor Rigger Crew Chief	Engineer Architect		
	Bridges, etc.							
	Buildings							
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

IX		PERSONAL DEVELOPMENT AND RECREATION						
Museums and Libraries	Curators Public Librarians Special Librarians Science Librarians Technicians	Page Shelver	Library Clerk Bookmobile Driver	Library Technician	Museum Technician	Librarian Curator Science Information Specialist	Library Director Curator Archeologist Archivist	
Service Programs--Community, School, or Industrial	Children's Programs Senior Citizen's Programs Adult Education Programs Recreational Sports Program Recreational Arts Programs Cultural Programs	Helper	Attendant Counselor Aide Recreation Assistant	Counselor		Social Worker Recreation Leader Teacher Nurse	Adult Education Superintendent Recreation Director Community Organization Specialist	
Commercial Programs and Services	Travel Services Tourism Entertainment Services Resorts Hotels		Tour Driver	Travel Clerk	Tour Guide Accommodation Appraiser Travel Counselor	Hotel Manager Resort Manager		
Governmental Programs and Services	Parks Tourism	Laborer		Local Guide Counselor	Tour Guide	Ranger Writer	Park Superintendent	---
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

X		CREATIVE ARTS						
Graphic Arts	Painting, etc. Sculpture Photography	Runner	Mat Cutter Ruling Pen Worker Dayroom Worker	Artist Letterer Illustrator Boardman Photographer	Artist Layout Artist	Artist Science Photographer Layout Artist Teacher Industrial Designer	Art Director	
Dramatic Arts	Writing Acting Production and Research Support	Helper	Propman Stage Hand Seamstress Extra Actor	Electrician Set Carpenter Actor	Stage Manager Coach Actor	Actor Agent	Producer Director Author Researcher	
Music	Composition Conducting Performing Production			Musician	Composer Musician Music Therapist	Composer Church Organist Music Librarian Musical Director (TV) Music Teacher	Composer Conductor Concert Artist	
Dance	Composition Conducting Performing Production			Chorus Dancer	Director	Choreographer Teacher Ballet Dancer	Choreographer Producer	
Literature	Writing Research			Author	Author	Author Researcher Instructor	Author Professor of Creative Writing	
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

XI		HEALTH, FAMILY AND PUBLIC WELFARE						
Health	Patient Care Services		Hospital Aide Health Aide	Practical Nurse Mental Health Technician	Chief Technician Nurse	Chief Nurse Occupational Therapist Nurse	Surgeon Physician Social Worker Psychologist	
	Administrative and Management Services		Ward Clerk Registration Clerk	Secretary Stenographer	Head Secretary Office Manager	Registrar Comptroller Dietician Accountant	Hospital Administrator Regional Manager	
	Allied Laboratory and Technological Services		Helper	Laboratory Technician Prosthetic Technician	Chief Technician	Laboratory Technologist	Pathologist Biochemist	
	Health Records and Statistical Services		Clerk	Records Clerk		Registrar Computer Programmer	Statistical Researcher	
	Library, Training, and Information Services		Clerk Receptionist	Library Technician	Technical Writer Illustrator	Librarian Public Health Educator Teacher		
	Pharmaceutical Services			Pharmacy Technician		Pharmacist	Pharmacologist	
	Dental Services		Assistant	Hygienist	Dental Lab Technician		Dentist	
Family Public Social Services	Nutrition Consumer Affairs Home Management Child Care Child Institutions Social Welfare		Aide	Technician	Dietician Social Worker Therapist			
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

XII		EDUCATION, TRAINING, AND RESEARCH						
Teaching	Elementary Secondary Technical School College Industrial and Commercial					Instructor Teacher	Dean Professor	
Guidance	Elementary Secondary Technical School College Industrial and Commercial					Counselor	Dean	
Creative and Applied Research, Physical Sciences	Individual Institutional Industrial and Commercial					Research Assistant	Research Director Research Scientist Research Historian Research Linguist Musicologist	
Creative and Applied Research Humanities (Languages, History, Writing, Arts, Music, etc.)	Individual Institutional Commercial							
Creative and Applied Research Social Sciences Anthropology Sociology Psychology, etc.	Individual Institutional Commercial							
	Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

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XII		EDUCATION, TRAINING, AND RESEARCH *(Continued)*						
Creative and Applied Research Life Sciences	Individual Institutional Commercial							
	Emphasis:	Things	Things, Data	Things, Data People	Data, People	Data, People	Data, People	People
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Appendix B

DOT OCCUPATIONAL CATEGORIES

Occupations	MASTER SHEET						
I Professional, Technical & Managerial Occupations							
II Clerical and Sales Occupations							
III Service Occupations							
IV Farming, Fishing, Forestry, & Related Occupations							
V Processing Occupations							
VI Machine Trades Occupations							
VII Bench Work Occupations							
VIII Structural Work Occupations							
IX Miscellaneous Occupations							
Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:	I. PROFESSIONAL, TECHNICAL, AND MANAGERIAL OCCUPATIONS						
Architecture and Engineering					Marine Architect Civil Engineer Electrical Engineer		
Mathematics and Physical Sciences						Physicist Chemist	
Life Sciences					Bacteriologist	Parasitologist Agronomist	
Social and Behavioral Sciences					Research Assistant	Sociologist Anthropologist	
Medicine and Health					Chief Nurse	Physician Veterinarian	Health Director
Education					Agricultural Agent Teacher	Professor Dean	Provost
Museum, Library					Librarian	Curator Researcher	
Law, Jurisprudence					Law Clerk	Attorney Judge	
Religion, Theology					Lay Minister	Ordained Minister	Archbishop
Writing					Writer		
Arts					Sculptor Painter		
Entertainment and Recreation					Actor	Producer Actor	
For Detailed Breakdown See DOT, Vol. II and Supplement I, 1966.	**Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

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Occupations In:	I. PROFESSIONAL, TECHNICAL, AND MANAGERIAL OCCUPATIONS *(Continued)*						
Administrative Specialization					Principal	Hospital Administrator School Superintendent	
Managers & Officials, NEC					Plant Manager	General Manager	
Miscellaneous							

For Detailed Breakdown See DOT, Vol. II and Supplement I, 1966.	Emphasis:	Things	Things, Data	Things, Data People	Data, People	Data, People	Data, People	People
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations in:	II. CLERICAL AND SALES OCCUPATIONS						
Stenography, Typing, Filing, etc.	Duplicator	Typist File Clerk	Stenographer Secretary	Office Supervisor			
Computing and Account-Recording	Assistant	Tabulator Operator Key-Puncher	Bookkeeper Teller	Console Operator	Programmer	Analyst	
Material and Production Recording	Clerk	Returns Clerk	Stock Supervisor	Receiving Foreman	Traffic Manager		
Information and Message Distribution	Messenger	Addressing Machine Operator	Messenger Supervisor	Mails Foreman			
Miscellaneous Clerical		Hotel Clerk	Claim Adjuster	Survey Coordinator	Loan Officer		
Salesmen, Services			Insurance Sales Freight Agent	Account Executive	Sales Superintendant: Wholesale Representative		
Salesmen, Commodities		Counter Sales Clerk	Wholesale Salesman	Construction Equipment Salesman	Nuclear Plant Sales Consultant		
Merchandising	Peddler	Vending Machine Collector	Routeman Auctioneer	Estimator			
For Detailed Breakdown, See DOT, Vol. II	**Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:	III. SERVICE OCCUPATIONS						
Domestic Service	Handyman	Housekeeper Cook Driver					
Food and Beverage Preparation & Service	Busboy	Hostess Counterman Waiter	Butcher Waiter	Head Waiter Chef			
Lodging and Related Service	Cleaner	Room Clerk Maid Bellman	Head Porter Banquet Houseman	Manager, Small	Superintendent of Services Manager, Large		
Barbering, Cosmetology, etc.	Assistant	Barber Masseur Manicurist	Hairdresser Embalmer	Manager			
Amusement and Recreation Service	Ticket Clerk	Ride Operator	Cardroom Supervisor Wardroom Mistress	Golf Professional Tennis Professional			
Miscellaneous Personal Service	Orderly	Stewardess Child Attendant	Midwife Horseshoer				
Apparel and Furnishings Service	Bundle Weigher Steamer	Laundryman	Touch-up Painter Shoe Repairman	Drycleaning Superintendent Dyer			
Protective Service		Parking Meter Maid Merchant Guard	Detective	Fire Captain Inspector	Police Chief		
Building and Related Service	Washer Sweeper Cleaner	Elevator Starter	Maintenance Supervisor Electrician	Building Foreman			
For Detailed Breakdown, See DOT, Vol. II.	**Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:	IV. FARMING, FISHING, FORESTRY, AND RELATED OCCUPATIONS						
Plant Farming	Extra Hand	Farm Hand	Tractor Driver Farm Machine Operator	Foreman Manager	Large Farm Manager		
Animal Farming	Ranch Laborer	Chicken Sexer Ranch Hand Caretaker	Poultry Technician Meat Poultryman	Rancher Ranch Foreman			
Miscellaneous Farming	Irrigator	Sprayer Operator	Thresher	Hand Irrigator Foreman			
Fishery and Related Occupations	Wharf Laborer	Net Fisherman Line Fisherman	Dredge Operator Hatchery Man	Pound-Net Captain Foreman of Rigging Scow			
Forestry	Tree Planter Fire Fighter	Pruner Sprayer	Fire Patrolman Plant Collector	Logging Inspector Fire Warden	District Manager Woods Boss		
Hunting, Trapping, and Related Occupations			Hunter Trapper Guide	Game Keeper			
Agricultural Service		Brusher Girdler	Week Inspector	Spray Foreman			
For Detailed Breakdown, See DOT, Vol. II	**Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:	V. PROCESSING OCCUPATIONS						
Metal Processing	Degreaser	Wire-coating Operator Scaleman	Furnace Keeper Temperer	Foreman, Electroplating Electroplater			
Ore Refining and Foundry	Spoutman	Mixer Grinding Mill Operator	Controlman Tungsten Refiner	Converter Foreman Nickel Plant Operator	Reduction Plant Foreman Blast Furnace Foreman		
Food, Tobacco, etc. Processing	Coffee Dumper Helper	Sausage Maker	Rice Miller Cocoa Press Operator	Refinery Operator Meatpacking Foreman			
Paper, etc. Processing	Helper	Pulper Rag Cutter	Pulp Bleacherman Wallboard Pressman	Coating Foreman Wetroom Foreman	Head Grinder Man		
Petroleum, Coal, Gas, etc., Processing	Slate Picker Wharfman	Screenman Coal Washer Breaker Tender	Pumpman Still Operator	Purification Foreman Chief Gas Worker	Still Man Treating & Pumping Foreman		
Chemicals, Plastics, Rubber, etc., Processing	Furnace Unloader	Glue Blender Mixer	Pumpman Binder Technician	Cosmetics Foreman Converter Operator	Chemical Compounding Foreman		
Wood Products Processing	Frame Stripper	Hydraulic Press Operator	Drier Operator Wood Flour Miller	Treating Plant Supervisor			
Stone, Clay, Glass Processing	Clay Mixer	Punch Press Operator Glass Furnace Technician	Kiln Fireman Glass Roller Operator	Tile Milling Foreman Concrete-Pour Foreman	Clay Preparation Foreman		
For Detailed Breakdown, See DOT, VOL. II. — **Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

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Occupations In:	V. PROCESSING OCCUPATIONS *(Continued)*						
Textile and Leather Processing	Garment Drier	Hat Blocker Rug-Dryer Operator	Wool Sorter Color Matcher	Department Foreman			
Processing, NEC							

For Detailed Breakdown, See DOT, VOL. II.	Emphasis:	Things	Things, Data	Things, Data People	Data, People	Data, People	Data, People	People
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:		VI. MACHINE TRADES OCCUPATIONS						
Metal Machining		Helper	Gear-Cutter Operator Polishing Machine Operator	Automatic Lathe Operator Lathe Setup Man	Patternmaker Tool and Die Foreman			
Metal Working NEC Shaping and Forging		Helper	Spring Tester Hydraulic Operator	Forging Press Operator Draw-Bench Operator	Heavy Forger Extrusion Foreman			
Mechanics Machine Repairman		Machinist Helper Greaser	Pump Installer Utility Man	Auto Mechanic Film Lab Mechanic	Aircraft Repair Foreman Fuel System Foreman	Manufacturer's Representative		
Paperworking		Sealing Machine Operator	Platen Press Operator	Corrugator Operator	Foreman, Paper Products			
Printing and Binding		Pressman Helper	Striping Machine Operator Covering Machine Operator	Press Operator Embosser	Bindery Foreman Experimental Pressman			
Wood Machining		Block Feeder	Veneer Lathe Operator	Cabinetmaker Ship Loftsman	Cabinetmaker Foreman Patternmaker			
Stone, Clay, Glass Machining		Helper Grinder Operator	Glasscutter Lens-Blank Finisher	Stone Grader Optical Model Maker	Stone Lathe Operator Crystal Processing Foreman			
Textile		Roller Cleaner	Skein Winder Weaving Inspector	Machine Fixer Hosiery Looper Fixer	Spinning Foreman Weaving Foreman			
For Detailed Breakdown, See DOT, Vol. II.	**Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

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Occupations In:	VI. MACHINE TRADES OCCUPATIONS *(Continued)*						
Machine Trades, NEC	Boot Vulcanizer Rubber Tube Splicer	Plastics Sawyer Leather Embosser	Tire Buffer				
For Detailed Breakdown See DOT, Vol. II.	**Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:	VII. BENCH WORK OCCUPATIONS						
Fabrication, Repair, Assembly of Metal Products	Cleaner Wire Inspector	Solderer Gold Cutter Tool Repairman Polisher	Silversmith Jeweler Jewelry Chaser	Engraving Foreman Hand Engraver			
Fabrication and Repair of Scientific, Medical, Optical Goods	Watch Band Attacher Watch Dial Paster	Lens Inspector Meter Aligner	Optician Camera Repairman	Prosthetics Foreman Dental Ceramist			
Assembly and Repair of Electrical Equipment	Cleaner Trimmer	TV Chassis Inspector Capacitor Assembler	Instrument Assembler Storage Battery Laboratory Man	Research Electrician Meterman			
Painting, Decorating	Tire Finisher Mirror Fitter	Porcelain Repairman Mirror Burnisher	Pottery Liner Glass Decorator	Finishing Foreman			
Fabrication and Repair Synthetics, Plastics, etc.	Laborer Rubber Goods Assembler	Balloon Maker Bootmaker	Tire Technician Plastics Fabricator	Plastics Patternmaker			
Fabrication and Repair of Wood Products	Wood Polisher Sander	Veneer Gluer Frame Builder	Basket Finisher Cooper	Furniture Finisher			
Fabrication and Repair, Sand, Stone, Clay, Glass Products	Ware Cleaner Stencil Cutter	Jewel-Bearing Driller Bisque Cleaner	Diamond Cleaner Glass Engraver	Gem Cutter Clay Shop Foreman			
Fabrication and Repair, Textile, Leather, etc.	Pocket Marker Buttoner	Upholsterer Hand Tufter	Statuary Plasterer Embroidery Designer	Upholstery Foreman Tailor			
Bench Work, NEC	Paper Trimmer Bag Stringer	Cigar Maker Cigarette Inspector					
For Detailed Breakdown, See DOT, Vol. II.	**Emphasis:**	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
	Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:	VIII. STRUCTURAL WORK OCCUPATIONS						
Metal Fabricating, NEC	Riveter Helper Laborer	Equipment Erector Deck & Hull Assembler	Reinforcing Iron Worker Aircraft Heat & Vent Mechanic	Reinforcing Steel Foreman			
Welding Flame Cutting, etc.	Production Line Solderer	Spot Welder Arc Cutter	Repair Welder Weld Inspector	Welding Foreman			
Electrical Assembling Installing Repair	Refrigeration Gas Charger	TV Cable Lineman Air Conditioning Installer	Transformer Assembler Aircraft Electrician	Substation Electrician Line Foreman			
Painting, Plastering, Cementing, etc.	Whitewasher	Auto Painter Helper Concrete Gun Operator	Plasterer Stucco Mason	Shipyard Painter Foreman			
Excavating Grading	Ditch Digger Mucker	Pipe Layer Gravel Inspector	Paving Cement Mason Dragline Operator	Asphalt Paving Foreman			
Construction Occupations, NEC	Carpenter Helper	Shorer Pipe Calker	Hydrant & Valve Setter Pipe Fitter	Joiner Foreman Coppersmith			
Structural Work Occupations, NEC	Tank Cleaner	Ship Yardman Dump Truck Driver	Diver Maintenance Foreman	Rigging Foreman			
Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Occupations In:	IX. MISCELLANEOUS OCCUPATIONS						
Motor Freight (Truck Drivers, Dumpsters, Route Drivers)	Loader Tanker Service-man	Truck Driver Routeman	Tractor-Trailer Driver	Truck Foreman Safety Engineer			
Transportation Occupations, NEC	Linesman Airport Laborer	Brakeman Seaman Ship Baggage Master	Railway Express Agent Ticket Sales Supervisor	Railroad Car Inspector Air Dispatcher			
Packaging and Materials Handling	Dental Floss Packer Bagger	Crane Operator	Coal-Tower Operator	Crane Crew Foreman Dock Foreman	Open Hearth Operator Stockyard Foreman		
Mineral Extraction	Chute Loader	Shuttle Car Operator	Oil Well Cementer	Cable Driller Production Foreman			
Logging	Whistle Punk Bush Monkey	Log Scaler Log Driver	Head Loader Log Marker	Boom Foreman Load Dispatcher			
Utilities Production and Distribution	Sewage Disposal Worker Street Cleaner	Pump Attendant Service Dispatcher	Switch Inspector Gas Meter Installer	Refrigerating Engineer Diesel Plant Operator	Substation Chief Operator		
Amusement, Recreation, Motion Picture, T.V., etc.	Film Splicer Assistant Cameraman	Standby Grip Property Man	Special Effects Man Lights Operator	TV Microphone Operator Recording Engineer			
Graphic Arts	Printing Plate Setter Print Washer	Teleprompter Film Inspector	Reproduction Technician Script Clerk	Electrotyper Developer			
Emphasis:	**Things**	**Things, Data**	**Things, Data People**	**Data, People**	**Data, People**	**Data, People**	**People**
Level:	*Unskilled* Laborer Assistant Helper Worker	*Semiskilled* Operator Clerical, Spec. Driver Assembler	*Skilled* Craftsman Technician Artisan Complex Operator Supervisor	*Highly Skilled* Middle Manager Foreman Official Semiprofessional	*Semiprofessional & Professional* 1. Technical, data 2. Social, people	*Advanced Professional, Planner* 1. Technical, data 2. Social, people	*Executive Upper Manager, High Level Planner*

Appendix C

OUTLINES OF THE NINE PROCESSES

I. COMMUNICATION PROCESS (Combined with Social, Political, and Economic Process to form one track, K-8; separate track from 9-12)

K 1. Basal Reception and Transmission Skills
(Listening - Reading, Speaking, and Writing)
a. Recognizing and decoding words
b. Analyzing phonetic structure of words
c. Accumulating vocabulary
d. Analyzing grammatical and syntactical structures
e. Following directions
f. Identifying
g. Listing
h. Charting
i. Summarizing

2. Basal Manipulative Skills
a. Comparing
b. Verifying
c. Interpreting
d. Outlining
e. Modifying
f. Classifying

3. Basal Applicative Skills
a. Deriving generalizations and principles
b. Analyzing verbal conceptual structures
c. Relating verbal concepts to new situations
d. Solving problems
e. Clarifying problems
8 f. Criticizing formulations of and solution to problems

9 4. Exploration in Specialized Communication Process Branches
A. Business Communication Skills
a. Business correspondence skills
b. Business oral communication skills
B. Foreign Languages
C. Literature
D. Improvement of Reception and Transmission Skills
a. Report writing
b. Note taking
c. Oral and written summarizing
d. Oral presentations
e. Essay writing
f. Technical writing

12 5. Selection or Rejection of Instructional Modules, for Entry Preparation in Branches 4A, B, C, or D.

II. SOCIAL, POLITICAL, AND ECONOMIC PROCESS (Combined with Communication Process to Form One Track, K-8; Separate Track, 9-12)

K ↓ 6

1. Introduction to Basic Concepts and Methods of Inquiry into:
   a. Social and cultural heritage of man
   b. Political institutions and economic systems
   c. Social organizations and culture
   d. American society and culture
   e. Man's social and personal behavior

7 ↓ 8

2. Continuing Orientation to Concepts and Methods of Inquiry into Man, Including Introduction to Organization and Structure of the Social Sciences Disciplines
   A. History
   B. Anthropology
      Archeology
   C. Sociology
      Political Science
      Economics
   D. Psychology

9 ↓ 10

3. Exploration in Selected Branches Studying Man, Culture, and Society. 2A, B, C, or D.

11 ↓ 12

4. Selection or Rejection of Instructional Modules for Further Work, Based on Student Choice of Entry Outcomes in Branches 2A, B, C, or D.

III. ARTISTIC PROCESS

K 1. Introduction to Means of Artistic and Creative Expression

- A. Performing Arts
  - a. Music
  - b. Acting
  - c. Singing
- B. Plastic Arts
  - a. Ceramics
  - b. Drawing
  - c. Sculpting
  - d. Carving
- C. Writing Arts
  - a. Novels
  - b. Short stories
  - c. Poems
- D. Technological Arts
  - a. Photography
  - b. Cinematography
  - c. Radio and television production

6

7 2. Further Student Selected Work in Branches 1A, B, C, and D

8

9 3. In-depth Exploration in any Combination of the Branches 1A, B, C, or D

10

11 4. Selection or Rejection of Instructional Modules for Preparation on Chosen Entry Outcomes in Branches 1A, B, C, or D

12

IV. TOOL AND HANDCRAFT PROCESS

K 1. Introduction to:
- a. Working with wood
- b. Working with metal
- c. Working with plants and gardens
- d. Working with brick and concrete

8 e. Working with plans and layouts

9 2. Exploration in Student-Selected Branches
- A. Woodworking and Carpentry
- B. Metalworking
- C. Landscaping and Gardening
- D. Masonry and Bricklaying

10 E. Drafting and Technical Design

11 3. Selection or Rejection of Instructional Modules for Preparation in Job Entry Through Branches 2A, B, C, D, or E

12

V. PHYSICAL DEVELOPMENT PROCESS

K 1. Basal Physical Skill Development
- a. Running
- b. Jumping
- c. Climbing
- d. Throwing
- e. Swimming

2. Introduction to Team and Individual Sports
- A. Team Sports
  - a. Baseball
  - b. Basketball
  - c. Volleyball
  - d. Football
- B. Individual Sports
  - a. Track
  - b. Tennis
  - c. Golf
  - d. Swimming
  - e. Gymnastics
  - f. Karate/Judo
  - g. Hiking

8

9 3. Exploration of Selected Team and Individual Sports Branches. 2A and B.

10

11 4. Selection or Rejection of Instructional Modules in Sport Branches 2A and B.

12

VI. INTERPERSONAL PROCESS

K 1. Introduction to Basic Concepts in Human Relations
- a. Structure of relationships
- b. Privileges and obligations
- c. Directing and ordering
- d. Moral codes of behavior

2. Introduction to Group Relations and Activities
- a. Exchanging information
- b. Assuming responsibility
- c. Influencing others

8 d. Supervising others

9 3. Exploration in Selected Branches of Interpersonal Relations
- A. Negotiating, Bargaining, and Selling
- B. Managing Group Activities
- C. Educating and Training

10 D. Treating, Advising, and Ministering to Interpersonal Problems

11 4. Selection or Rejection of Instructional Modules in any Branches. 3A, B, C, or D.

12

VII. MATHEMATICAL PROCESS (Combined with Scientific and Technological Processes K-6; Separate Track, 7-12)

K 1. Introduction to Elementary Numerical Concepts and Systems

2. Manipulation of Mathematical Systems in Simple Operations

3. Application of Mathematical Systems in Solution of Everyday Problems

4. Introduction to General Measurement Operations
   a. Linear, weight, volume, and mass
   b. Chemical
   c. Electrical
8 d. Altitude

9 5. Exploration in Selected Branches
   A. Advanced Mathematical Systems
   B. Computer Applications
10 C. Technical Measurement

11 6. Selection or Rejection of Further Instructional Modules in Branches 5A, B, or C.
12

VIII. SCIENTIFIC PROCESS (Combined with Mathematical and Technological Processes K-6; Combined with Technological Process 7-8; Separate Track, 9-12)

K

1. Introduction to Basic Concepts of Scientific Method of Inquiry
   a. Observation
   b. Identification
   c. Classification
   d. Experimentation
   e. Scientific theories and constructs

2. Continuing Orientation to Scientific Methods of Inquiry: Introduction to the Organization of Scientific Disciplines
   a. Natural sciences
   b. Life sciences
   c. Physical sciences

8

9

3. Exploration in Selected Scientific Disciplines
   A. Life Sciences
      a. Biology
      b. Botany
      c. Zoology
      d. Anatomy
      e. Physiology
   B. Natural Sciences
      a. Geology
      b. Meteorology
      c. Oceanography
      d. Geography
   C. Physical Sciences
      a. Physics
      b. Chemistry
      c. Astronomy

10

11

4. Selection of Instructional Modules for Entry Preparation in Branches 3A, B, C, or Their Subdivisions.

12

IX. TECHNOLOGICAL PROCESS (Combined with Scientific and Mathematical Processes, K-6; Combined with Scientific Processes, 7-8; Separate Track, 9-12)

K–6
1. Introduction to:
   a. Operation of machines
   b. Functions of machines
   c. Automation of production

7–8
2. Orientation to Technological Processes
   A. Business Machine Operation
   B. Machine Production Tool Operation
   C. Machine Installation, Operation, and Repair
   D. Computer Operation
   E. Electronics

9–10
3. Exploration in Selected Technological Process Branches, 2A through E.

11–12
4. Selection of Instructional Modules in Branches 2A through E for Job Entry.

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